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Opposed to Reciprocal Trade Agreements

Program Has Resulted In Reduction of Duties On Over Seventy Grades of Paper and In Cases New Duties Are Below Tariff of 1913, According To Allen G. Goldsmith Speaking For the Industry.

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., March 6, 1940—"The Reciprocal Trade Agreement program has resulted in the reduction of duties on over seventy grades of paper, comprising more than 75 per cent of the entire product of an industry whose output is valued at upward of one billion dollars per year, and in some cases the new duty rates are below those of the Tariff Act of 1913, which was the lowest rate tariff in American history." This was the statement made Monday on behalf of the American paper and paper board industry by Alan G. Goldsmith, vice-president of the Mead Corporation, and vice-president of the National Paperboard Association.

Opposed to Secret Negotiations

Indicating that the paper and paper board industry is opposed to the secret negotiation of tariff reductions, and its belief that the public, through the United States Senate should have a voice in the procedure, Mr. Goldsmith continued:

"It is not the intention of the pulp, paper and paper board industry to enter into a discussion of criticism of the tariff making policy in this country. We do, however, feel that facts should be presented by citing past history and present trends which will show what the results of recent tariff developments have been and what may occur.

No Revolutionary Developments

"This industry was highly mechanized about one hundred years ago, and revolutionary developments since that time have not occurred. Every country in the world has access to and possesses the same mechanical devices and the same chemical processes that are used in this country. Other industries may have attained advantages through new inventions and new developments which enabled them for a time, at least, to compensate for the higher wage levels and higher standard of living which generally prevail in the United States—but this is not the case in the paper industry. The only difference between the pulp and paper industry in this country and in competitive areas lies in the difference in the wage scale and conditions of labor. These are not being compensated for in the other fields. There is plenty of capacity available in this country for a normal expansion. There is also plenty of capacity available abroad anxious to increase its foothold in this, the largest market, for pulp, paper and board and their products in the entire world. We consume about 60 per cent of all these products manufactured throughout the globe.

"The need for thoroughgoing and careful study of the entire world situation, and of conditions of this industry is evident if we are to continue as a stable industry."

Mr. Goldsmith then analyzed the damaging results of the existing agreements upon such branches of the paper industry as the wrapping paper manufacturers in the southern pine and other regions, printing papers in the northern states and fine tissue papers in New England. He presented tables showing that American paper mill employes' average earnings are more than twice those in the foreign countries with the highest labor costs, and showed that undue tariff reductions are a direct threat to American standards of living.

A. D. Hill Appointed to Paper Committee

WASHINGTON, D. C., March 6, 1940—The appointment of Arthur D. Hill, Sr., prominent attorney and former Corporation Counsel of Boston, Massachusetts, as a representative for the public on the Pulp and Primary Paper Industry Committee, was announced today by the Wage and Hour Division, U. S. Department of Labor.

Mr. Hill, a former professor of law at Harvard University, will fill a vacancy on the Committee occasioned by the resignation of Professor Sumner H. Slichter, economist of Harvard University.

The Pulp and Primary Paper Industry Committee will hold its first meeting in Washington on March 18 under the chairmanship of John A. Lapp, Chicago publicist and educator. The Committee will investigate economic and competitive conditions in the industry, as defined, which employs about 150,000 wage earners.

The total annual production of this industry is valued at about one billion dollars, and is carried on in about 750 establishments.

To Rebuild Last of Nine Dams on Fox River

United States Engineering Office States Rebuilding of Last of Nine Government Dams Providing Water Facilities To Paper Mills On Fox River Will Start April 1 — Higher Freight Rates Opposed — Other News.

[FROM OUR REGULAR CORRESPONDENT]

APPLETON, Wis., March 4, 1940—The last of nine government dams providing water power facilities for the paper mills along the lower Fox River is to be rebuilt starting April 1, according to the United States Engineering office. The dam is the upper one of the series at Appleton, operating on one of the widest sections of the river, and will replace one in use many years and now obsolete.

Total cost of the project will be $140,000, of which $120,000 will be for general construction, and the remaining $20,000 for inspection, wiring and other items. The new structure will be of concrete, with automatic steel gates. When completed, all nine of the dams extending from Neenah and Menasha, Wis. to De Pere, Wis. will be new.

The general contract has been awarded to C. R. Meyer & Sons Company of Oshkosh, Wis. The dam controls the water levels for navigation at Appleton and furnishes power for several plants at that point.

Defends Objection to Freight Rate Rise

Defense of the paper manufacturers of Wisconsin in objecting to increases in freight rates on pulp was voiced by Robert Nixon, of the Wisconsin Public Service Commission, in a dissent from a majority report issued by the commission last week approving a ten per cent increase.

"In my judgment it is shortsighted policy to exact the last pound of flesh at this time in order to produce a rather insignificant increase in revenues to the railroads in dollars and cents when such exaction is likely to seriously affect the competitive conditions in the paper industry," Mr. Nixon said. He declared an increase of five per cent "is probably justified," but he denied the ten per cent increase is wise or fair.

"The competitive struggle of the Wisconsin paper mills with those in other sections of the country and in particular with the rapid development of production in the South is one of grave concern," said the commissioner. "Southern producers have many economic advantages over paper producers in this state. Moreover, evidence discloses that the manufacture of paper in this state has been attended in several instances by heavy losses and some of the manufacturers have been forced into reorganization proceedings in the federal courts.

"These producers are bearing increased transportation costs levied upon both inbound and outbound freight, including the increases applied to the transportation of coal from Illinois, Indiana, and other eastern fields.

Cites Canada and European Competition

"The record discloses that Canadian pulp and pulp from European producers is also entering into competition with Wisconsin pulpwood. This means substantial loss of tonnage to Wisconsin railroads. If this process of diversion (to trucks) is permitted to continue, the effect upon the railroads will be serious. The paper and pulp industry constitutes the predominant traffic industry in the north and central portions of the state. It is of vital importance to the Wisconsin railroads that this industry continue in existence in this state."

In support of its decision to grant the ten per cent increase, the commission said:

"Upon a review of the record in this matter, we are convinced that the present rates have not been shown to be in excess of reasonable maximum rates. They are substantially lower, generally speaking, than apply within Minnesota or than apply on interstate movements between Minnesota and Wisconsin. They are not higher than those that apply within Michigan or single lines and are lower than those on joint lines. They are lower than apply on interstate movements between Wisconsin and Michigan. Wisconsin railroads earned less than one per cent of their book value for the first six months of 1939."

To Finance Wolf Reservoir Project

Negotiations are being carried on by the Wolf River Reservoir Company with users of water power on the Fox River to finance the proposed construction of a water storage reservoir on the upper Wolf River at Lily, Wis. Stock will be sold to the users, who will pay tolls according to the benefits received, with approval of the rates by the Wisconsin Public Service Commission.

The company was expected to start construction of the reservoir early this year, but no petition has been filed with the commission as yet seeking permission to build. It is believed these arrangements will be made as soon as the financing is assured.

Ahdawagam Raises Wages

Ahdawagam Paper Products Company, Wisconsin Rapids, Wis., has announced pay increases of three cents per hour in the lower brackets and two cents per hour in the upper brackets, and two cents per hour for women employees. The increase brings the base hourly rate to a minimum of 56 cents per hour, except for a six-month starting rate of 53 cents per hour for new employees on common labor. The rates were fixed after conferences of Frank Walsh, manager, with union representatives, and will constitute the terms of the regular company-employee agreement to be negotiated by May 1.

Color Atlas for Fiber Identification Out

The Institute of Paper Chemistry, Appleton, Wis., has announced publication of "A Color Atlas for Fiber Identification." It was prepared by John H. Graff, research associate and instructor in fiber microscopy.

The Atlas presents for the first time a complete series of charts showing the colors obtainable from the reactions of the important stains with those fibers

Joint Abitibi Committees Expected to Meet

Report States A Joint Meeting of Three Abitibi Power and Paper Company's Committees May Meet To Review Present Situation — Interlake Tissue Mills At Capacity—To Refinance Lake Sulphite Co.—Other News.

[FROM OUR REGULAR CORRESPONDENT]

TORONTO, Ont., March 4, 1940—It is understood that at an early date a joint meeting of the three Abitibi Power and Paper Company's committees, namely, those representing preferred shareholders, common shareholders and unsecured creditors, will be held in Toronto, when the present situation will be reviewed. This joint meeting follows closely upon rumors circulated recently to the effect that the Abitibi Bondholders' Protective Committee (The Symington Committee) had decided to give no consideration to any plan for reorganization of the enterprise. This report followed upon a meeting in Toronto between members of the protective committee and certain of the Canadian Institutions.

The report caused some surprise because it was only a few days after Hon Peter Heenan stated at the timber inquiry that he understood negotiations were under way which would have the effect of bringing the company out of the receivership and he hoped the investigation would not hamper such negotiations, which hope apparently was shared by Col. Drew, leader of the opposition. The policy of the Ontario Government apparently favours friendly reorganization and is opposed to forced sale. It was laid down in the House last September and at the recent timber investigation that view was restated.

Delay Reported Causing Concern

Though bondholders are officially represented by the Symington Committee, reports of delay caused concern to many bondholders who, from a practical viewpoint, are just as interested in bringing the company out of receivership as are the shareholders. The rumor of delay has also led to rumors of a renewal of foreclosure efforts although such threats were previously understood to have been dispelled by the announcement of government policy.

As the timber reserves upon which the company and its successor must rely are under the control of the Ontario Government, it would appear that failure to comply with the government's "get together" request will result in appeals to the government by small bondholders and shareholders to insist more strongly upon straightening out the Abitibi tangle. Efforts have been made publicly by representatives of the shareholders—the owners of property—to bring about a friendly reorganization on a basis that will provide bondholders with their priority and permit investors in the company shares to retain their interest in the business.

Suggests Relief Labor in Forests

The "real challenge" facing the Ontario Timber industry is the "harvesting of mature timber," according to Edward E. Johnson, timber operator and chairman of the industrial commission of Fort William, Ontario. Appearing lately as a witness before the Legislature Commission investigating administration of Ontario timber resources, Mr. Johnson outlined conditions affecting the industry in the Lakehead area.

He suggested consideration of the use of relief labor to place mature forests on a basis of maximum yield per acre. Persistency of self propagation of forests should be encouraged by removal of less valuable varieties. He also urged greater fire protection and pest control. Artificial planting was necessary in some places he said, but it was questionable if this should be undertaken at present in Northern Ontario.

Mr. Johnson said he advocated labor "getting every possible cent the (timber) traffic will bear," but the basic wage rate at the Lakehead was "entirely out of line with competitive schedules." He urged study of some system of annual wages instead of high pay for five or six months and then no pay at all. He also told of conditions in competitive United States fields and said it was difficult for Canadian companies to compete under present conditions.

Interlake Mills at Capacity

The business of the Interlake Tissue Mills Company, Toronto, whose plant is at Merritton, Ont., has been at a high level for the past year and a half. The plant has been operating to near capacity. The company does not publish financial statements and has been able to liquidate its inventory of finished products at good prices. Not much of the good showing has been due to the war although price levels have moved up a certain extent. From the cost standpoint is understood that high rate of operations has kept manufacturing costs down. This has about offset the somewhat higher cost of materials. The shares of the Interlake Tissue Mills Company, Limited, of which George Carruthers, Toronto, is the president and S. F. Duncan, vice-president, are not actively traded in but recently there was a transaction in which 105 shares changed hands at $105 a share. The purchaser was unable to obtain all the stock that he desired. The capitalization of the company consists of $625,000 in $100 par value common stock. The Interlake Tissue Mills Company makes a wide range of paper specialties including paper napkins, towels, decorative crepe papers and similar lines. Although a certain amount of export business is available the company has not been able to handle this in recent months owing to domestic demands which are heavy.

To Refinance Lake Sulphite Co.

It is understood that plans for the refinancing of the Lake Sulphite Pulp Company, Red Rock, Ont., are under way. This was the information that the Hon. Peter Heenan, Minister of Lands and Forests, gave the special committee inquiring into the timber administration of the province of Ontario. He said that the plan had been delayed by the inquiry. At its final session the Ontario Legislature authorized the select committee to continue its inquiry after prorogation.

Canadian Newsprint Mills Can Meet Demand

E. M. Little, General Quebec Superintendent of Anglo-American Pulp & Paper Co. States Canada's Newsprint Plants Are Well Fitted To Supply Any Likely Increase In Demand In Near Future—Other Industrial News.

[FROM OUR REGULAR CORRESPONDENT]

MONTREAL, Que., March 4, 1940—E. M. Little, general superintendent in Quebec for the Anglo-American Pulp and Paper Company, speaking in Montreal, said that Canada's newsprint plants are well fitted to supply the increased demands likely to be made upon them in the immediate future.

"It is not necessary to build another newsprint mill in Canada, to meet additional demand, until all the latent capacity has been used up," he said. "There is still possibly 10 to 20 per cent of capacity available which would bring our Canadian productive capacity close to 5,000,000 tons, without building another mill.

"Canada's newsprint production in 1939 was 2,869,000 tons. The 1940 capacity of the industry is 4,300,000 tons. In 1939 the industry operated at 58 per cent. of capacity. It has been forecast that operations in 1940 may reach a high of 80 per cent. Should that come I think it would be better to make extensions to existing mills, where possible, as this will be cheaper than building new ones."

Sees Steadily Rising U. S. Demand

He foresaw a steadily increasing demand for newsprint from the United States, with some estimates that by 1950 the U.S. demand would be for 5,000,000 tons, compared with 1939 consumption of 3,500,000 tons. He referred to the recent experiments in the making of newsprint in the southern states, and did not see any appreciable threat to the Canadian industry, declaring that the southern newsprint was at present inferior to that produced in the north, although still suitable for the making of newspapers.

Mr. Little urged Canadian newsprint companies to diversify their products, as he believed that a steadily growing and profitable export business could be achieved in various branches of pulp and paper production. The use of rayon, he instanced, was increasing by leaps and bounds. Also, the United States alone imports annually about 2,500,000 tons of Scandinavian pulp products, largely kraft. At present there was a shortage in the United States in unbleached sulphite.

"With $50 a ton newsprint, plus the 10 per cent exchange from the United States sales, and with 70 per cent of capacity in production, the newsprint industry is reaching a more profitable level of operations," said Mr. Little.

Sharp Rise in Exports This Year

A sharp rise in the exports of both newsprint and pulp as compared with those at the beginning of last year is shown in the government return just issued for January. Newsprint exports amounted to 4,515,036 cwts., valued at $9,781,083, as compared with 3,872,489 cwt., valued at $8,290,258 in January, 1939. Total wood pulp exported amounted to 1,869,773 cwt., valued at $4,320,939, as compared with 941,245 cwt., valued at $2,227,779 in January, 1939. Thus the pulp and paper companies have received for their exports $3,593,985 more than they received in January, 1939.

Of the newsprint exports 3,526,610 cwt., valued at $7,486,800, went to the United States. The next largest customer was Australia, which took 603,716 cwt., valued at $1,437,765. The remainder mostly went to Empire and South American countries. The United Kingdom took only 6,103 cwt., valued at $15,424.

The bulk of the pulp shipments also went to the United States, but Japan figured for 176,960 cwt. of bleached sulphite, valued at $487,396.

To Fix Lumbermen's Wages

The Quebec Government proposes to put into the hands of a Minimum Wage Board, yet to be created, the question of fixing the wage scales for lumbermen, of whom about 35,000 are engaged in woods operations.

This change has been decided upon as the result of a deputation of lumbermen waiting on the Government.

During the last session forest workers were paid at a rate of $45 a month for skilled hands, plus food and lodging. It was estimated, however, that most employers could obtain about 12½ per cent of their labor at $30 a month plus board and accommodation.

With the province's vast forest wealth reported as being hardly touched, and with Mexico becoming a bigger customer every day, prospects for the lumber industry are generally conceded here to be unusually bright.

Hudson Valley Paper Co. Burns

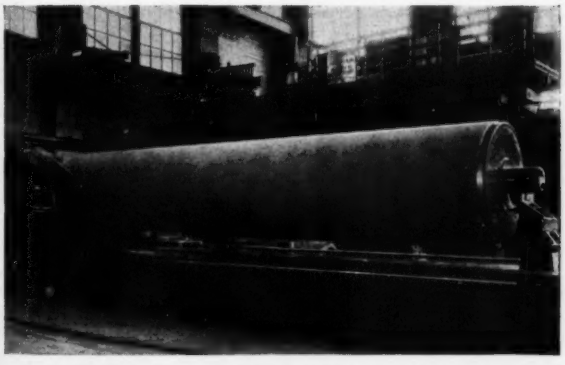
ALBANY, N. Y., March 4, 1940—A spectacular fire here last week virtually destroyed the plant of the Hudson Valley Paper Company with a loss estimated at $200,000. The blaze followed an explosion that shattered neighboring structures and which brought thousands of spectators to the scene. The blast opened the entire front of the main floor to a draft which shot the flames, originating in the shipping room, up a stairway to each of the three upper floors. The three upper floors were filled with paper stock, most of which was wholly destroyed either by fire or water.

More Workers To Have Vacations

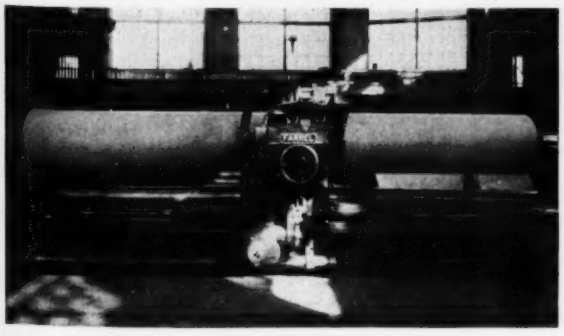
APPLETON, Wis., February, 1940 — By changing the service requirements of its vacation plan from five to three years, Kimberly-Clark Corporation, Neenah, Wis., has made vacations with pay available to approximately 600 more workers this year. The service must have been continuous prior to January 1, 1940. Employees with fifteen years or more of service will receive an additional half week of paid vacation.

WHAT ARE YOUR SPECIFICATIONS ?

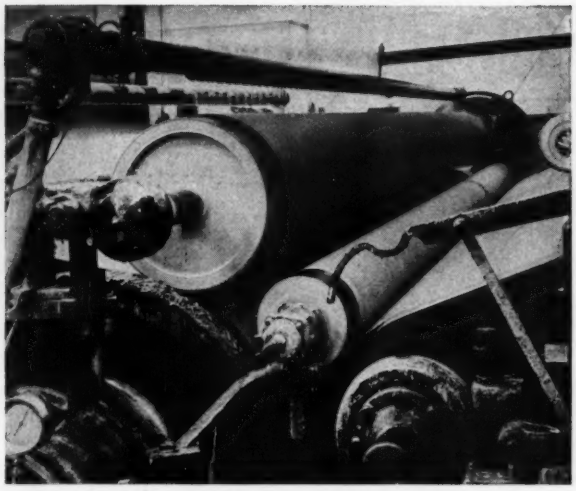
Stowe-Woodward's modern, fully-equipped shop is prepared to produce rubber covered rolls of any size and weight, for any service. May we tell you what we can do on cost and delivery of rolls to your exact specifications.



STONITE for Beloit Dual Press. 222" long x 41¼" diameter.



Top Rubber Press Roll. 241" long x 28¾" diameter.



FEATHERLITE Lumpbreaker Roll, 230" long x 16" diameter, 1½" covering.

STONITE Top Press Roll. 238" long x 27½" diameter.

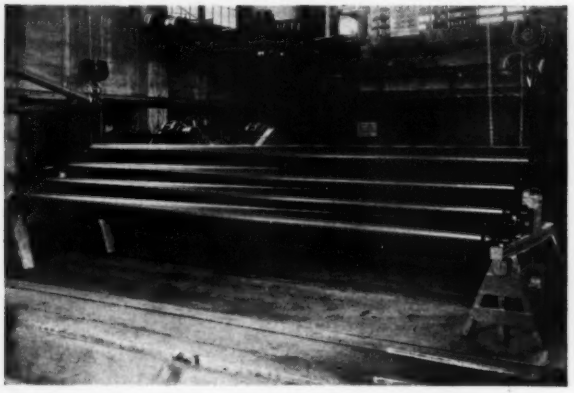


Table Rolls to run on high speed news at 1380 feet per minute. 240" long x 10" diameter.

STOWE-WOODWARD, INC. NEWTON UPPER FALLS · MASS.

NEW YORK OFFICE · WOOLWORTH BLDG.

Stowe-Woodward Rolls are made on the West Coast by HUNTINGTON RUBBER MILLS, INC., Seattle, Washington

Makers of **WHITE STAR** *Rubber Covered Rolls,* **TANNITE** *Couch Rolls*
STONITE *Top Press and Smoothing Rolls—All by the* **COREWELD** *Process*

Chicago Trade Expects Normal Spring Rise

Paper Men In Midwest Look For Normal Revival of Trade About April 1 and Strengthening of Prices—Illinois Truck Act Puzzles Merchants—Western Salesmen Enjoy Bowling—Cobean To Visit South America.

[FROM OUR REGULAR CORRESPONDENT]

CHICAGO, Ill., March 4, 1940—Local paper executives are predicting that the paper industry will experience a normal Spring upturn in business beginning around April 1 and likewise expressing the belief that such upturn cannot come without a material strengthening in the price situation. The belief is based on analysis of the shortage in pulp and on the increased possibilities of Scandinavian participation in the war. Meanwhile, business is comparatively quiet with the markets holding firm though orders are not overly plentiful. Kraft papers were reported as in fair shape with buyers quite cognizant of the long term worries over raw material shortages. Bonds and ledgers were little changed, the entire line of sulphite bonds showing as yet little evidence of widespread buyer interest. Books and covers were quiet. Specialties reported only normal reaction to the proximity of the early Easter period. Waste papers were firmed up locally with the higher grades reported as in fair demand among buyers.

Truck Enforcement Postponed

Paper merchants and manufacturers, still puzzled over the requirements of the Illinois Truck Act, were advised this week that the effective date of the law had been extended from March 1 to April 1 because of the fact that enforcing offices were swamped with work. Almost at the same time three Illinois truckers filed suit in the Sangamon County Circuit Court asking an injunction against state officials to restrain the defendants from enforcing the law. One of the petitions points out that the act does not regulate trucks but regulates truckers and the operation of the trucking business and charges discriminaiton in that it requires insurance denied members of the Negro race. The paper industry's interest in the trucking act rises, in part, from the many restrictions and requirements as to insurance, inspection and regulation which add to the cost of transportation. There are five separate divisions of trucking interests within the act including the private and mercantile carriers who have only to pass safety tests, print the name of their company and empty weight of the truck on the truck and give evidence of proper insurance coverage to qualify.

Bowling Activity Increases

The midwest division of the Salesmen's Association of the Paper Industry is finding that the Saturday bowling program, initially arranged to "fill in between golf seasons," is becoming a major activity. The Bowling League now gives weekly reports of standings and thus provides the salesmen with a more accurate checkup of the skill of competitors. The current listing, for February, shows the five highest seasons averages going to SAPEYES Brucker 173, Johnson 159, George 157, Babbitt 155 and Baker, Strindmo and Warner 154. Moreau, with an average of 92 pins is at the bottom of the pile of 23 contestants. High single game for the season goes to Johnson with 229 while Warner has a 555 total for the highest three games.

Johnsos Heads Midland Sales

Luke Johnsos has recently been appointed sales-manager of the Midland Paper Company division of the Zellerbach Paper Corporation. Luke Johnsos is widely known in Chicago not only as an efficient paper sales executive but as one of the most prominent athletes in this area. As an athlete at Northwestern University Luke won much acclaim as a football player and later joined the Chicago Bears, continuing his achievements as an end on George Halas' professional aggregation. The combination of personality, popularity among many people and accurate knowledge of the paper industry and buyers needs should make Mr. Johnsos ideally qualified for his new position with Midland.

George Cobean to Visit South America

George Cobean, vice-president of the Butler Paper Corporation, will leave by plane for South America on March 13 for an extended visit with the date for his return as yet not fixed. Mr. Cobean planned to leave immediately following the N.P.T.A. meetings in New York City but returned to Chicago to find a number of pressing duties which delayed his departure. The well known executive who was recently president of the National Paper Trade Association spent four months in South America last year and now states that he will certainly be away for the remainder of 1940 and perhaps even longer. The Butler executive is well versed in South American languages and utilizes his trips to visit with lithographers, printers, advertisers and other paper users in the neighboring continent.

Miss Schenk Goes to New York Office

Miss Katherine Schenk, for over two years identified with the Chicago school sales department of Bermingham & Prosser, has recently been transferred to the eastern educational offices of the company located in New York City. Miss Schenk will assist in the development of the Bermingham & Prosser policy of distributing its well known supply of school papers through school supply houses in all parts of the country.

B. James Burke Passes C. P. A. Exam

B. James Burke, son of Thomas J. Burke, secretary-treasurer of the Sulphite Paper Manufacturers Association, has just received advice that he has passed the certified public accountants examination for the State of New York and will receive his diploma on completion of three years' public accounting work. He is on the staff of Scovell, Wellington & Co., in New York City.

BELOIT HORIZONTAL *Dual Press*

PATENTS PENDING

● The Beloit Horizontal Dual Press has been improved by incorporating a primary roll over the first suction press, adding another nip. Thus, this press is now equivalent to three presses instead of two, the first suction roll doing double duty.

● The success of the Beloit Horizontal Dual Press has been definitely established. This new press gives even better results.

THE BELOIT WAY BELOIT IRON WORKS PAPER MACH'Y BELOIT WIS. **IS THE MODERN WAY**

BELOIT IRON WORKS BELOIT WISCONSIN

FINANCIAL NEWS

New York Stock Exchange

High, Low and Last for the Week Ending March 6, 1940

	High	Low	Last
A.P.W.	2⅝	2⅝	2⅝
Armstrong Cork Co.	40⅛	39½	40
Celotex Corp.	12	11¾	11¾
Celotex Corp., pf.	66	66	66
Certain-Teed Products Corp.	7⅛	6¾	6⅞
Certain-Teed Products Corp., pf.	34	32½	33½
Champion Paper & Fibre Co.	23⅞	22¾	22¾
Champion Paper & Fibre Co., pf.	105	105	105
Congoleum-Nairn Co.	23½	22⅜	23¼
Container Corp. of America	16⅜	15½	16⅜
Continental-Diamond Fibre Co.	7⅜	7⅛	7⅜
Crown-Zellerbach Co.	17⅛	16⅝	16⅞
Crown-Zellerbach Co., pf.	92¼	90½	92
Flintkote Co.	19⅞	19⅜	19¾
Robert Gair	3½	3⅜	3¾
Robert Gair, pf.	15	14	15
International Paper & Power	13⅛	12¼	13
International Paper & Power, pf.	58¼	55⅜	57⅞
Johns-Manville Corp.	70½	69	70⅜
Johns-Manville Corp., pf.	124⅛	124½	124½
Kimberly Clark Corp.	38	36½	38
MacAndrews & Forbes pf.	134½	134	134
Masonite Corp.	35⅛	34½	35
Mead Corp.	10⅝	10¼	10½
Mead Corp., pf.	65⅛	65⅛	65⅛
Paraffine Companies, Inc.	43¼	42	43
Rayonier, Inc.	17¾	17⅛	17¾
Rayonier, Inc., pf.	28¾	28	28¾
Ruberoid Co.	20	19⅝	19⅞
Scott Paper Co.	46¾	46¼	46¾
Scott Paper Co., pf.	113½	113	113½
Sutherland Paper Co.	34⅞	33⅜	33⅜
Union Bag & Paper Corp.	14¼	13¾	14
United Paperboard Co.	5⅝	4⅞	5¼
U. S. Gypsum Co.	82¼	80½	81½
U. S. Gypsum Co., pf.	178½	178½	178½

New York Curb Exchange

High, Low and Last for the Week Ending March 6, 1940

	High	Low	Last
American Box Board Co.	5⅝	5⅝	5⅝
Brown Co., pf.	27	23½	26
Great Northern Paper	43½	43¼	43¼
National Container Corp.	10¾	10¼	10¾
St. Regis Paper Co.	2⅞	2¾	2⅞
St. Regis Paper Co., pf.	67	67	67
Taggart Corp.	4¾	4¾	4¾

Fraser Companies Report Loss

MONTREAL, Que., March 4, 1940.—The annual report of Fraser Companies, Limited, shows that as a result of a heavy deficit suffered by the Restigouche Company, a subsidiary, net operating results for 1939 record a loss of $208,638 as compared with a loss of $18,352 for the year 1938.

Restigouche Company Limited, reports a net loss for 1939 of $415,484 as compared with a loss of $2,912 in 1938; hence Fraser Companies Limited and its wholly-owned subsidiaries, Fraser Paper Limited and Fraser Realties Limited, actually showed an improvement in results for last year with net profits after all charges of $206,846 as compared with a net loss for the preceding year of $15,440.

Consolidated statement shows operating profits for 1939 of $1,768,529 as against $6,986,528 for 1938 and $3,051,796 for 1937. The net loss after all charges of $208,638 shows a substantial reduction from that of $443,728 reported in the unaudited preliminary statement for the nine months ended September 30, 1939, indicating a marked improvement to a profitable basis of operations in the fourth quarter.

In reviewing operations for the year in the report, K. C. Maclachlan, president, says in part: "The pulp and paper mills at Edmundston, N. B., and Madawaska, Maine, operated at a somewhat higher percentage of capacity than during the previous year. The earnings while showing an improvement were, however, affected by reduced prices. The demand for sulphite pulp produced by the Restigouche Company was weak during the first three quarters of the year. A heavy demand has been experienced since that time and the mill is now running to capacity. Lumber sales for the year were slightly ahead of those for the previous year with prices holding at about the same levels."

Abitibi Earns $447,775

[FROM OUR REGULAR CORRESPONDENT]

TORONTO, Ont., March 4, 1940—Earnings of Abitibi Power and Paper Company, Limited, Toronto, for January, prior to audit and charges for depreciation and bond interest, amounted to $447,775 compared with $387,406 for December, 1939, and $162,297 for January, 1939. Included in the above earnings for January, 1940, is $127,979 received as premium on United States funds.

Shipments of newsprint, according to G. T. Clarkson, receiver and manager, in January, amounted to 25,800 tons compared with 27,476 tons in December and 21,688 tons in January, 1939. Present indications are that shipments of newsprint in February will be about 23,500 tons compared with 20,542 tons in February last year.

Shipments of sulphite pulp in January amounted to 5,415 tons, compared with 4,982 tons in December and 3,422 tons in January, 1939. Present indications are that shipments of sulphite pulp in February will amount to about 5,475 tons compared with 2,846 tons in February last year.

Crown Zellerbach Profits Up

The Crown Zellerbach Corporation and subsidiaries report a net profit of $5,797,632 for the nine months ended on January 31, 1940, equal to $1.68 a common share after preferred dividends. The profit in the same period of the previous fiscal year was $3,484,383, or 66 cents a share. The latest figure is after minority interests and a further charge of $185,345 due to revaluation of net current assets of the Canadian subsidiary at the equivalent United States dollar value.

Net sales for the nine months were $41,715,622, compared to $36,140,516, and total operating income was $42,657,427, against $36,608,648.

Kimberly-Clark Nets $2,053,586

[FROM OUR REGULAR CORRESPONDENT]

NEENAH, Wis., March 4, 1940—Net income of $2,053,586 for common stock in 1939 was announced last week by Kimberly-Clark Corporation. They are the highest since 1930.

The earnings, which are after preferred dividends, represent **$4.21 per common share,** compared with $2.66 in 1938, $3.61 in 1937, $4.99 in 1930 and $2.33 in 1929.

Net sales totalled $27,861,360 as against $26,555,730 in 1938. Cost of sales amounted to $22,233,713, compared with $21,679,178, and gross profit was

$5,627,647 as against $4,876,552. Selling, general and administrative expenses were $2,365,315 compared with $1,999,802 the previous year. Profit from operations was $3,262,332, against $2,687,749 in 1938.

Bond interest amounted to $397,729 and preferred dividends totalled $597,780.

A net loss of $171,687 was reported for the William Bonifas Lumber Company, wholly owned subsidiary, and there was also a report of 60 per cent of the net loss of the North Star Timber Company amounting to $23,182, in which Kimberly-Clark has a 60 per cent interest.

Great Northern Nets $2,727,442

The Great Northern Paper Company and wholly owned subsidiaries for 1939 report a net profit of $2,727,442, equal to $2.73 each on 997,480 shares of $25 par capital stock, against $2,168,809 or $2.17 a share in 1938. Current assets as of Dec. 31, 1939, including $5,985,933 cash, amounted to $13,879,186 and current liabilities were $1,195,587, compared with cash of $5,118,049, current assets of $14,174,749 and current liabilities of $1,070,260 at end of preceding year. Inventories were $6,435,856, against $7,416,023.

West Virginia Earnings Rise

The West Virginia Pulp and Paper Company and subsidiaries for the quarter to January 31 reports a net profit, subject to audit, of $754,583, equal, after 6 per cent preferred dividend requirements, to 58 cents each on 902,432 shares of common stock. Net profit in January quarter last year was $389,164, or 17 cents a common share. Company's fiscal year ends on October 31.

Gaylord Earns $662,042

The Gaylord Container Corporation and subsidiary reports a net profit of $662,042 for 1939, equal after dividend requirements on 5½ per cent preferred stock, to 71 cents each on 539,221 common shares, against $869,070 or $1.11 a common share in 1938.

Rhinelander Nets $272,456

RHINELANDER, Wis., March 4, 1940—Net profits of the Rhinelander Paper Company rose from $118,140 in 1938 to $272,456 in 1939, according to the company's report issued last week. Earnings were increased from 79 cents to $1.82 per common share.

Badger Mills Earn $251,905

PESHTIGO, Wis., March 4, 1940—Net profits of Badger Paper Mills, Inc., totalled $251,905 for 1939, according to E. A. Mayer, president. This compares with $255,145 for the preceding year.

Eaton Earns 31 Cents a Share

The Eaton Paper Corporation for 1939 reports a net profit of $51,473, equal to 31 cents each on 34,093 shares of common stock, compared with $17,059 in 1938.

TO REBUILD LAST OF NINE DAMS

(Continued from page 16)

most commonly used in the papermaking industry. These colors are always observed under a microscope and it is impossible to measure them with any known technique, especially since mixtures of fibers are almost always present. Their evaluation involves a large personal equation. Because of the slight differences in shade which often result, long experience and a keen sense of color are required to recognize and distinguish them. The charts represent the conception of one observer who has spent most of his life in the study of stains and staining reaction.

The book includes 21 pages of text and 5 color charts. With each volume is an extra set of charts to be used in the laboratory.

700 Attend Safety School Session

More than 700 attended the Twin City safety school session at Menasha, Wis., last week, sponsored by the paper mills and other industries. The principal speaker was Major Norman C. Imrie of Columbus, Ohio, associate editor of the Columbus Dispatch. The country is suffering, he said, from ignorance of the causes of social disturbance and economic maladjustment, apathy to the heavy toll of death and injury from accidents, and paralysis of the moral backbone when it comes to action to remedy conditions. The remedies, he said, are akin to a sign he read in New York, "Light, Heat and Power" . . . the light of truth, of learning, of science, of applied knowledge to dispel the darkness of ignorance; the heat of enthusiasm, and the power of courageous, purposeful, organized action.

Sectional meetings were held prior to the address as follows: "Maintenance," Herbert Vogel, Marathon Paper Mills Company; "Loading and Unloading Cars," Ralph Suess, Menasha Wooden Ware Corporation; "Paper Machines," Howard Aderhold, Marathon mills; "Gas and Fumes," Melvin Buxton, Marathon mills, and "Personal Hygiene," Miss Donnie Brown.

T. B. McCabe on Business Council

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., March 6, 1940—Thomas B. McCabe of the Scott Paper Company, Chester, Pa., has been appointed a member of the Business Advisory Council of the Department of Commerce. George H. Meade of the Meade Corporation, Dayton, Ohio, is the only other paper man member of this Council.

Nathan T. Bartlett, formerly connected with the NRA and TNEC, has been appointed secretary of the Council following the resignation of E. Willard Jensen.

Eliot Ness to Speak at Boston

BOSTON, Mass., March 4, 1940—Eliot Ness, Director of Public Safety, Cleveland, O., is to be the speaker at the 54th Anniversary Banquet of the Boston Paper Trade Association, to be held Wednesday evening, March 20, at the Algonquin Club. Mayor Maurice Tobin and Police Commissioner Joseph Timilty, Boston, are to be guests of honor. Three applications for regular membership and one for limited are to be voted on.

Technical Men Visit Cyanamid's Stamford Research Laboratories

At the invitation of American Cyanamid and Chemical Corporation a large group of members of the Technical Association of the Pulp and Paper Industry who were in attendance at the Annual Convention at the Roosevelt Hotel, New York City, visited Cyanamid's Stamford Research Laboratories on February 23.

This group left the Roosevelt Hotel at 9:15 A.M., in a chartered Greyhound bus. Upon arrival at Stamford the party was divided into small groups and conducted by guides through the entire building in order to give the visitors a brief but general picture of the entire laboratory.

Starting at the fifth floor, the tour wound its way down through the Patent and Abstract Division, the Research division, Physics Division, Technical Service, Mining Chemicals and Chemical Engineering Divisions and Service Departments. After this, the party adjourned for luncheon where those of the company responsible for the arrangements were introduced, among them, Harold Freeman, Chester Landes, J. D. Lowery, William Harding, Coleman Caryl and Dr. Norman Shepard. After luncheon Dr. M. C. Whitaker, vice president of American Cyanamid Company, in charge of research and development, gave a short address explaining the functioning of the laboratory as well as its aims.

Upon the return to the laboratory, the group was again divided and directed by guides to the various laboratories where the men in charge explained the work in progress and the nature and purpose of that particular department, explaining as well the operation of the many pieces of special equipment on view.

The showing of an industrial moving picture, recently produced for Cyanamid, both of laboratory and plant operation, concluded the tour.

Those in Attendance

The group picture presented herewith was taken at the laboratory and includes the following:

H. B. McGee, Imperial Paper and Color Company, Glens Falls, N. Y.; R. H. Simmons, U. S. Government Printing Office, Washington, D. C.; Fred W. O'Neil, N. Y. S. College of Forestry, Syracuse, N. Y.; Foster P. Doane, International Paper Company, Ft. Edward, N. Y.; Harold E. Beck, Newark, N. J.; G. J. Brabender, Marathon Paper Mills Company, Rothschild, Wis.; S. B. Jones, West Virginia Pulp and Paper Company, Piedmont, W. Va.; L. E. Simerl, Mead Corporation, Chillicothe, Ohio; W. H. Anderson, Stevens Paper Mills Company, Windsor, Conn.; Maurice Rueben, Southern Kraft Company, York Haven, Pa.; J. G. Patrick, West Virginia Pulp and Paper Company, Luke, Md.; W. O. Hisey, N. Y. S. College of Forestry, Syracuse, N. Y.; B. K. Steadman, Standard Paper Company, Richmond, Va.; Charles M. Koon, Institute of Paper Chemistry, Ap-

PICTURE OF TECHNICAL MEN TAKEN AT CYANAMID'S LABORATORIES.

pleton, Wis.; Eugene Loumean, Lily Tulip Cup Company, College Point, N. Y.; Edward H. Hill, West Virginia Pulp and Paper Company, Covington, Va.; H. Stanley Bristol, International Paper Company, Niagara Falls, N. Y.; John H. Rich, Newton Falls Paper Company, Newton Falls, N. Y.; Carl Apelgren, Taggart Corporation, Oswego, N. Y.; Frederick W. Farrell, McLauren Jones Company, Brookfield, Mass.; Arthur Reilly and Joseph A. Warren, S. D. Warren Company, Cumberland Mills, Me.; Robert B. Blakeslee, Imperial Paper and Color Company, Glens Falls, N. Y.; R. E. Stone, Curtis Paper Company, Newark, Delaware; A. Lowenstein, Appleton Coated Paper Company, Appleton, Wisc.; J. J. O'Connor, Mead Corporation, Chillicothe, Ohio; C. A. Minor, Fraser Paper Company, Madawaska, Me.; Merle R. Wilkins, Bryant Paper Company, Kalamazoo, Mich.; John R. Curtis, Scott Paper Company, Chester, Pa.; W. H. Brydges, Bedford Pulp and Paper Company, Big Island, Va.; J. D. Lowery, F. Gunther, A. E. Griffin, O. M. Cornell, K. E. Youngchild, E. B. Taylor, D. B. Morris, J. C. Barthel, A. W. Foley, W. D. Kavanaugh, H. B. Freeman, A. C. Bate, J. M. Walsh, and W. S. Taylor, American Cyanamid and Chemical Corporation.

Government Paper Bids

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., March 6, 1940—The Government Printing Office has received the following bids for 85,400 pounds of white sulphite writing paper; Whitaker Paper Company, 4.88 and 5.16 cents; Mudge Paper Company, 5.94 cents; Perkins Goodwin Company, 4.875 cents; R. P. Andrews Paper Company, 5.33 cents; Barton, Duer & Koch Paper Company, 5.03 cents; Stanford Paper Company, 5.75 cents; Cauthorne Paper Company, Inc., 5.83 cents; Graham Paper Company, 5.96 cents; Aetna Paper Company, 6.06 cents; Old Dominion Paper Company, 6.238 cents; Mathers-Lamm Paper Company, 5.77 cents.

For 2,000 sheets of Quaker drab cloth lined paper; Mudge Paper Company, $147.97 per M sheets; Barton, Duer & Koch Paper Company, $148.49; Whitaker Paper Company, $148.17; Graham Paper Company, $153,50; Old Dominion Paper Company, $152.90; and Stanford Paper Company, $155.00.

For 13,671 pounds of buff sulphite index paper; Whitaker Paper Company, 5.7 cents; Mudge Paper Company, 6.63 cents; Perkins-Goodwin Company, 7.13 cents; Stanford Paper Company, 6.9 cents; Cauthorne Paper Company, Inc., 6.73 cents; Virginia Paper Company, 6.9 cents; Barton, Duer & Koch Paper Company, 6.75 cents; Aetna Paper Company, 7.95 cents; Old Dominion Paper Company, 5.918 cents; Walker, Goulard Plehn Company, 6.67 cents less 2%; and Mathers-Lamm Paper Company, 6.7 cents.

For 67,800 pounds of white sulphite index; Whitaker Paper Company, 5.45 cents; Mudge Paper Company, 5.86 cents; Perkins-Goodwin Company, 6.18 cents; Stanford Paper Company, 6.5 cents; Cauthorne Paper Company, Inc., 5.94 cents; Virginia Paper Company, 6 cents; Barton, Duer & Koch Paper Company, 5.87 cents; Aetna Paper Company, 6.83 cents; Paper Corporation of U. S., 5.94 cents; Old Dominion Paper Company, 5.598 cents; Walker, Goulard Plehn Company, 5.53 cents; and Mathers-Lamm Paper Company, 5.91 cents.

Gair Co to Build in Middletown

The Robert Gair Company, Inc., 155 East 44th street, New York City, announces the purchase of a plot of land at Portland, Conn., consisting of about eight acres, located adjacent to the new bridge to Middletown. A building, consisting of approximately 80,000 square feet of manufacturing space will be erected on this plot. The building will be one-story, mill construction, brick walls, concrete floors, wooden roof deck, waterproofed. It will have approximately headroom of 14 feet in the manufacturing space and 20 feet in the roll storage department. Excavation will begin immediately, and it is expected that the plant will be in operation in a few months. The plant is located on a special siding of the New York, New Haven & Hartford Railroad, and the site includes additional land for expansion.

In the interest of service to customers in the State of Connecticut, middle and Western Massachusetts, and other nearby points, there will be installed in this new factory complete equipment for the manufacture of corrugated shipping cases, floor display stands, and other corrugated products. The most modern equipment and manufacturing methods will insure economy in manufacture and special emphasis will be placed on fine color printing, today so important in this field.

The Gair Company is one of the largest and oldest in the shipping container field, as well as in the manufacture of folding paper cartons, paperboard, solid fibre containers, etc. The company operates plants in Piermont, Brooklyn, Tonawanda, Syracuse, and Utica, N. Y., Bogota, N. J., Haverhill, Newton Upper Falls and Holyoke, Mass., New London, Conn., and Cleveland, Ohio, as well as numerous factories in Canada.

Charge Pulp Mills with Monopoly

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, March 4, 1940—A statement that paper-pulp mills have a "hog-tied monopoly" in dealing with small timberland owners was made before a joint Congressional forestry investigation last week by Representative Fulmer of South Carolina, vice chairman of the group.

Mr. Fulmer cited recent anti-trust action against the Southern Pine Association at New Orleans in support of his allegation that farmers and other small land owners "get almost nothing" for wood sold to pulp mills.

Representative Fulmer's comments came during an exchange with Senator Smith, also of South Carolina, over respective Federal and State powers in dealing with forestry, farm and other national problems.

Senator Smith said he was "getting tired of having everybody run up here to Washington over every little thing."

Mr. Fulmer suggested that States be required to meet certain legislative standards on timber cutting, reforestation and fire protection before they receive any share in Federal funds provided for acquisition and protection of forest lands.

H. A. Hicks, committee investigator, testified that commissions for agents, contractors and other middlemen took a large part of the price that pulp mills were paying Southern land owners for timber.

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Henry J. Berger
EDITOR

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COMING EVENTS IN PAPER INDUSTRY

New England Section. Technical Association of the Pulp and Paper Industry—Third Friday of each month at the Roger Smith Hotel, Holyoke, Mass.

Delaware Valley Section. Technical Association of the Pulp and Paper Industry—Second Friday of each month at the Engineers Club, Philadelphia, Pa.

Lake States Section. Technical Association of the Pulp and Paper Industry—Second Tuesday of each month at the Conway Hotel, Appleton, Wis.

Kalamazoo Valley Section. Technical Association of the Pulp and Paper Industry—First Thursday of each month at the Park, American Hotel, Kalamazoo, Mich.

LABOR LAW REVISION

The recent Congressional investigations of the practices of the National Labor Relations Board have disclosed so many inequalities that the House Committeemen are expected to advise changes in the National Labor Relations Act, otherwise known as the Wagner Act. At the end of the proceedings on February 28, the Labor Board had completed its defense and the committee recessed hearings indefinitely to hold executive sessions to prepare a preliminary report which is expected to be submitted to Congress at an early date and to embody suggestions for changes in the National Labor Relations Act.

With the unanimous action of the House in voting an additional $50,000 for use by the investigating committee, and in the prospect that differences between committee members may be resolved in a report satisfactory to all, positive action on the labor law is viewed as likely at this session of Congress. Studies forming the base for the intermediate report to Congress have been made under the direction of Representative Howard Smith of Virginia. During the hearings the activities of the Labor Relations Board have been revealed in sufficient detail to show that it is practically impossible for a Labor Board of three members to pass upon 10,000 cases in one year, when these Board members serve as prosecutor, judge and jury. As the result of the revelations in the testimony of the young review attorneys, upon whose recommendations the Board largely depended, the Smith committee is expected to make recommendations for a separation of the administrative and prosecuting activities of the Board from its judicial functions.

It is further expected that the committee headed by Representative Smith, will recommend a change in the present set-up by removing trial examiners in Labor Board cases from the control of the Board and have them selected by an independent agency. Another recommendation now deemed likely, is that the committee will recommend an amendment to the Act to extend protection to an employer of his right of free speech. In the present Act the employer is not permitted to express himself if his expression should reach his employees and should influence them in their attitude toward a union. The four-point proposal of Representative Robert Ramspeck, of Georgia of the committee, has suggested four proposals as follows: (1) That the present three-man Labor Relations Board be replaced by a five-man board. (2) That provision be made to permit courts to review decisions of the new Labor Board in all cases that involve decisions by the Board concerning which union shall be recognized as the bargaining agent for workers. (3) That all elections to determine which union shall represent workers be confined to a single plant. At present the Labor Board can conduct elections on an industry-wide basis, taking in all of the plants of an industry. Mr. Ramspeck favors confining elections to one plant, but would permit industry-wide bargaining provided all of the plants were in favor of bargaining on that basis. (4) That the Labor Board be prevented from interfering with contracts or working arrangements between employers and bona fide unions. Employers are, of course, particularly interested in the last proposal.

The Wage-Hour Law, like the Labor Relations Act has also failed to accomplish the purpose it was expected to achieve. With the appointment of Col. Philip B. Fleming, an Army engineer, to the post of Administrator of the Wage and Hour Division some two weeks ago, Administrator Fleming appointed two new committees to make recommendations for increasing the legal minimum wage rate in two industries, paper and pulp, and leather. In commenting on the operation of the Wage-Hour Law the Chamber of Commerce of the United States stated last month: "After watching eighteen months' operation of the Wage-Hour Law, the Chamber's Committee on Manufacture expressed to the board its conviction that the Chamber's opposition to the legislation at the time of its enactment was right and that the Chamber should continue vigorously to advocate its repeal.

"Compensation for employment cannot be equitably apportioned, nor can enduring increases in employment be secured, through centralized federal regulation of wages and hours. We believe, therefore, that, with regard to minimum wages, maximum hours and working conditions, there should be only

such public regulation as may be validly applied by state governments for those special classes of workers for which legislative protection may be necessary to prevent their oppression and to safeguard their health and well-being. The fundamental objective of Congress, as disclosed by discussion on the floor and in committee reports while the legislation was under consideration, was the protection of those workers who received abnormally low wages or were required to work an excessive number of hours, in other words, the elimination of "sweatshop" labor.

"In actual operation, however, the committee asserts, the law has been applied to a large number of workers not included in either of the foregoing classifications and has consequently been productive of great confusion and of injustice to employers and employees alike. The use of vague and uncertain phraseology in the statute, the delegation of authority to the Administrator to define terms of general application, and the natural tendency of the administrative agency to extend its authority all combined to produce this result, it is declared."

The basic objection revealed in the direct reports to the committees, based upon the experience under the law on the part of several thousand employers, in general are highly critical of the effects of this legislation, not merely upon the employers but upon the employees whom the law is designed to benefit. The basic objection disclosed by these reports relates to the attempt through the wage-hour law to prescribe a rigid regulation over hours and wages throughout the country uniformly applicable to all kinds of business and business operations.

Buys Paper Under Walsh-Healey Act

WASHINGTON, D. C., March 6, 1940—During the week ended February 17, the Government purchased $141,436.23 worth of paper and allied products under the Walsh-Healey Act as follows: $17,690.56 worth of writing paper for the Navy Department from the Whitaker Paper Company, Baltimore, Md.; $62,612.00 worth of paper for the Navy Department from the R. P. Andrews Paper Company, Washington, D. C.; $11,550.00 worth of templet paper for the Navy Department from the West Jersey Paper Manufacturing Company, Camden, N. J.; $36,260.81 worth of masking tape for the Navy Department under an indefinite contract other than General Schedule with purchases to be made if and when needed from Minnesota Mining and Manufacturing Company, St. Paul, Minn.; and $13,322.86 worth of index cards from Samson Paper Prod. Company, New York, for the Navy Department.

Morgan Paper Co To Build

There will shortly be started in Toronto construction by the Morgan Paper Company of a modern new plant which will cost $50,000 and ground has been acquired for the site. The company makes paper boxes, containers, and other paper goods.

Production Ratio Report

These statistics are based upon paper production reports to the American Paper and Pulp Association.

COMPARATIVE MONTHLY SUMMARIES[1]

Months	1940	1939	1938	1937	1936	1935	1934
January	90.9%	77.5%	63.9%	90.3%	76.1%	65.8%	.....
February	.....	81.7%	68.7%	90.1%	77.9%	70.0%	.....
March	.....	84.0%	69.6%	90.3%	76.0%	70.5%	.....
April	.....	82.9%	68.3%	92.1%	82.3%	70.0%	.....
May	.....	80.2%	69.0%	90.6%	81.6%	69.4%	.....
June	.....	79.7%	66.0%	87.3%	80.7%	72.3%	.....
July	.....	75.2%	72.0%	81.8%	77.3%	64.9%	.....
August	.....	82.9%	77.2%	82.9%	81.5%	70.9%	.....
September	.....	88.7%	76.3%	78.6%	80.5%	71.9%	58.2%
October	.....	96.6%	82.5%	73.5%	87.6%	75.6%	64.7%
November	.....	97.2%	79.6%	61.9%	88.0%	75.3%	61.7%
December	.....	91.1%	74.4%	54.5%	85.9%	71.2%	59.6%
Year Average	.....	84.9%	72.3%	80.6%	81.3%	70.5%	.....
First 8 weeks	89.5%	79.6%	66.3%	90.2%	76.9%	67.3%	.....

COMPARATIVE WEEKLY SUMMARIES[1]

CURRENT WEEKS, 1940		CORRESPONDING WEEKS, 1939	
January 20	90.8%	January 21	78.0%
January 27	91.9%	January 28	81.4%
February 3	89.7%	February 4	80.7%
February 10	88.5%	February 11	82.8%
February 17	86.9%	February 18	82.6%
*February 24	84.8%	February 25	80.6%

The following statistics show the number of mills reporting by ratio groups:

	Number of Mills Reporting—Current Weeks					
Ratio Limits	Jan. 20, 1940	Jan. 27, 1940	Feb. 3, 1940	Feb. 10, 1940	Feb. 17, 1940	Feb. 24, 1940
0% to 50%	41	48	45	47	49	40
51% to 100%	259	252	252	246	225	161
Total Mills Reporting	300	300	297	293	274	201

PAPERBOARD OPERATING RATIOS

Per cents of operation based on "Inch-Hours" reported to the National Paperboard Association.

Year	Jan.	Feb.	Mar.	Apr.	May	June	July
1936	62%	67%	67%	70%	69%	70%	69%
1937	80%	86%	86%	88%	85%	77%	66%
1938	54%	60%	61%	57%	58%	56%	57%
1939	60%	67%	71%	69%	64%	67%	63%
1940	71%	....	....	....	....	....	....

Year	Aug.	Sept.	Oct.	Nov.	Dec.	Year Avg.
1936	75%	78%	82%	80%	74%	72%
1937	74%	69%	65%	55%	45%	73%
1938	66%	66%	70%	65%	59%	61%
1939	72%	74%	84%	81%	71%	70%
1940	....	....	....	....	....	....

Week end. Jan. 20, 1940—72%
Week end. Jan. 27, 1940—75%
Week end. Feb. 3, 1940—72%
Week end. Feb. 10, 1940—71%
Week end. Feb. 17, 1940—70%
Week end. Feb. 24, 1940—69%

[1] Production-capacity ratios are based upon six-day capacity ratings which are adjusted periodically to correspond with the ratings reported by individual companies. Ratios are subject to revision until all reports are received.

* Preliminary figure.

Paper Control Disturbs Britain

WASHINGTON, D. C., March 6, 1940—British paper manufacturers have become greatly perturbed during the past few weeks at the effect which the restrictions imposed by the Paper Control have had upon their business, and they are hoping for a drastic modification of this control.

The question is one of price. Manufacturers claim quite reasonably that they should be permitted to sell their paper at a fair profit above the cost of production. The Control has issued certain prices to be charged by the paper manufacturers and these are alleged to be entirely uneconomical. In consequence orders have been refused in a number of cases. The result has been to encourage consumers to buy foreign papers at greatly increased prices.

They Started Something!

FEW discoveries have had such a profound effect on the history of man as that of James Watt, who first conceived the possibilities of steam as a source of power and subsequently developed the steam engine.

Watt's invention started the Industrial Revolution and set the world on a new course of history. For steam provided the power with which the first great machines of the modern industrial era were driven—and is still, more than 170 years after its discovery, one of the greatest factors in this amazing era of scientific advancement.

EBG engineers, too, started a revolution in special fields of industry when they produced Liquid Chlorine for the first time in America and made available the means for better bleaching of paper, textiles and other materials. Their pioneer efforts resulted, also, in safer living and better health throughout the country because of the vital role Liquid Chlorine plays in the purification of water and the sterilization of sewage. EBG engineers have been responsible for many of the greatest contributions Liquid Chlorine has made in industry and sanitation.

The first cylinder of Liquid Chlorine made by EBG in 1909.

There is a sense of safety and security in dealing with a company that is first in its field. You know that its representatives understand your problems and are capable of giving the right answers wherever their product is concerned. Use EBG Liquid Chlorine—and get the benefit of EBG's pioneering experience.

EBG Liquid Chlorine

FIRST IN THE COUNTRY

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Main Office: 60 East 42nd Street, New York, N. Y.
Plant: Niagara Falls, N. Y.

Section of the
Technical Association of the Pulp and Paper Industry

Edited by Ronald G. Macdonald, Secretary

Retention of Aluminum Ion and Hydrogen Ion in Papers

By Herbert F. Launer[1]

Abstract

The decrease in pH, observed when paper-water mixtures are heated and then cooled, was found to be ascribable to the increased hydrolysis of the aluminum salts in the papers. Studies of fiber-alum-water mixtures showed that aluminum is retained by the fibers, and that the amount of aluminum in papers is thus much larger than that calculated from the concentrations involved in the manufacture of papers. It was found that the fibers raise the pH of alum solutions to which they have been added by an amount which is characteristic of the type of fiber and of the concentration of the alum. It is also shown that the change in pH upon heating such mixtures is likewise determined by the type of fiber and the concentration of the alum. Hydrogen-ion is also strongly retained by fibers in an amount shown to be unchanged after heating and cooling.

In a recent publication *(1)* dealing with the determination of the *p*H values of papers by the method of cold extraction, it was found that these values were usually higher, by 0.6 *p*H, on the average, than those obtained when extraction was made at 100 deg. C., as in the TAPPI*(2)* standard method. An explanation for the cause of this difference was not given at that time as the main efforts were devoted to finding whether the simpler method of cold extraction was preferable from a practical standpoint. In the present article a study of the underlying causes of this difference is presented.

Investigators have previously studied the effects of hot extraction. Browning and Ulm*(3)* have shown that hot extraction gives lower *p*H values than cold extraction and ascribe this in part to the increased hydrolysis of alum, $Al_2(SO_4)_3 \cdot 18H_2O$, added in the course of papermaking. Kullgren *(4)* found that the hydrolysis of $AlCl_3$ in a 0.002 *N* solution increased 10-fold upon raising the temperature from 25 deg. to 100 deg. C. Furthermore, Heyrovsky*(5)* found that the reversal of this hydrolysis reaction takes place slowly, and that $AlCl_3$, the hydrolysis of which had been increased by heating, remained in that condition long after cooling.

In discussing another possible explanation of the effect of heating, Browning and Ulm point out the possibility that sulphuric acid, which arises from the hydrolysis of alum, and which acid they assume is adsorbed by the fibers in the cold, may be released upon heating, thus lowering the *p*H. Their experiments do not show conclusively that sulphuric acid is adsorbed under the conditions of extraction. They also present titration curves which show that weak organic acids are present in the extract. No evidence has been presented, however, as to what extent organic acids extracted or formed during the hot extraction contribute to the measured *p*H. Since in both cases, namely, liberation of adsorbed sulphuric acid, if any, or formation of organic acids, or both, by heating, the *p*H may be effected, it is necessary to determine the magnitude of these effects before dealing with any other possible effects of heating.

Furthermore, Browning and Ulm observed that a solution of alum did not change in *p*H upon heating when sulphite fibers were present, although large *p*H changes occurred in the absence of the fibers. This points to a complexity which is greater than the behavior of simple alum solutions, and an explanation for this apparent discrepancy is offered herein.

Finally, it is important to decide whether the amount of hydrolyzable aluminum salt in the finished paper is simply the amount present in the paper-machine solution held by the fibers (1 g. of fibers holds 1.5 g. of paper-machine solution before entering the machine driers), or whether the amount of aluminum is actually much larger than this, by virtue of its selective retention of aluminum by the fibers in the beater and chest.

It was believed that a study of these points would not only provide a fundamental basis for choosing between the two methods of extraction, but would also add to existing information concerning the chemistry of paper.

Relationship Between Changes in pH by Hot Extraction and Amounts of Alum Used in Paper Manufacture

For the sake of clarity, a part of the experimental results presented in the previous publication*(1)* are shown in Table I. As was previously pointed out, the similarity of changes in *p*H, column 7, is misleading in that it shows little with regard to acidity changes. When these are expressed as changes in hydrogen ion concentration, column 8, the correlation with the

[1] Technician, National Bureau of Standards, U. S. Dept. of Commerce, Washington.

amounts of alum, column 4, indicates strongly that the acidity changes occurring upon heating the paper-water extracts are dependent upon the amounts of alum used in making the papers, except for smaller effects, such as amount of alkaline rosin size and type of fiber used in making the papers. This correlation and factors affecting it were discussed in the previous publication *(1)*.

TABLE I.—RELATIONS BETWEEN THE ACIDITY VALUES AND OTHER CHARACTERISTICS OF THE PAPERS.

1	2	3	4	5	6	7	8	9	10
Sample [a] number	Fibers	Rosin, per cent	Alum,[b] per cent	pH using cold extraction	pH using hot extraction	pH change upon heating	(H^+) change upon heating, Equiv./liter $\times 10^{-7}$	(H^+) using cold extraction, Equiv./liter $\times 10^{-7}$	pH change upon heating filtrates
1	New rags.....	0.9	4.0	4.9	4.3	0.6	376	126	0.6
2	"	1.7	4.0	5.1	4.4	0.7	321	79	0.0
3	"	0.9	2.0	5.2	4.5	0.7	253	63	0.4
4	"	1.7	2.0	5.4	4.7	0.7	160	40	0.2
5	"	0.2	1.5	5.5	4.9	0.6	94	32	0.1
6	"	1.8	1.2	5.6	5.0	0.6	75	25	0.0
7	"	0.9	1.1	5.6	5.0	0.6	75	25	0.0
8	"	1.6	0.9	6.4	5.9	0.5	9	4	0.0
9	"	0.3	0.8	6.4	6.0	0.4	6	4	..
10	"	0.8	0.7	6.3	6.0	0.3	5	5	..
11	"	0.3	0.5	7.2	7.3	..	...	0.6	..
12	Soda-sulphite (1:1)	1.2	2.4	5.2	4.6	0.6	188	63	0.3
13	"	0.2	2.1	4.9	4.3	0.6	376	126	0.6
14	"	0.2	1.5	5.3	4.8	0.5	108	50	0.2
15	"	1.6	1.4	5.5	4.9	0.6	94	32	0.0
16 [c]	"	0.9	1.3	5.8	5.1	0.7	63	16	0.0
17	"	1.0	1.3	5.9	5.1	0.8	66	13	0.0
18	"	1.2	1.1	6.0	5.3	0.7	40	10	..
19	"	0.3	1.0	6.4	5.7	0.7	16	4	0.0
20	"	0.9	0.8	6.2	5.5	0.7	26	6	..
21	"	0.3	0.5	6.6	6.2	0.4	4	2.5	..
22 [c]	"	0.3	0.0	6.9	6.4	0.5	3	1.3	0.0
23	Special sulphite [d]..	1.9	2.3	5.2	4.9	0.3	63	63	0.1
24	"	1.7	1.1	5.6	5.3	0.3	25	25	0.0
25	"	1.1	0.8	5.6	5.0	0.6	75	25	..
26	"	1.6	0.8	6.1	5.7	0.4	12	8	..
27	"	1.1	0.6	6.0	5.7	0.3	10	10	..
28	"	0.2	0.0	6.9	7.2	..	..	1	..
29	Bleached sulphate [d]	1.0	2.3	5.2	4.9	0.3	63	63	0.2
30	"	0.9	1.0	5.8	5.0	0.8	84	16	0.0
31	"	0.9	0.7	6.4	6.0	0.4	6	4	..
32	"	0.1	0.0	6.8	7.0	..	..	2	..

[a] These papers were made in the paper mill of the National Bureau of Standards.
[b] Percentage of alum was based on dry weight of solid materials in the chest.
[c] These papers contained no clay, all others listed contained 8 to 13 per cent clay.
[d] Pulps subjected to special purifying process by the manufacturers.

Effect of Acids from Sources Other than Hydrolysis of Aluminum

The correlation between the amounts of alum and the change in acidity upon heating may be interpreted in another manner, namely, that the amounts of any organic acids from cellulose produced during heating by the action of the hydrogen ion, resulting from hydrolysis, may increase with increasing proportions of alum. Although any organic acids produced would probably be weak, and their ionization would, therefore, as Browning and Ulm point out, be repressed by the strong acid, it has not yet been shown conclusively that they do not contribute to the measured *p*H when papers are extracted by heating.

The possibility that hydrogen ion retained by the fibers in the cold may be released during heating, must also be considered, since it will be shown that fibers extensively reduce the acidity of hydrolyzed alum solutions.

These points were investigated, using the experimental technique described in *(1)*, as follows. A solution of alum having a *p*H of 4.7, containing 0.0031 g. per 70 cc. was heated as in the method of hot extraction for 1 hr. at 100 deg. C. Upon cooling, the *p*H was found to be 3.7. Continued heating produced no further appreciable change in *p*H. To 70-cc. portions of this hydrolyzed alum solution 1-g. portions of fibers from samples 11, 22, 28 and 32 were added, and after 1 hr. at room temperature the *p*H of the mixtures was determined. The *p*H in every case was found to be much higher after than before the addition of the fibers to the previously heated solution, showing that extensive decreases in the concentration of hydrogen ion had occurred. The results are given in Table II, column 2. It should be pointed out that this hydrolyzed alum solution remained at *p*H of 3.7 for several days when no fibers were added. Samples 11, 22, 28 and 32 were in the neutral region, as shown by the values for *p*H-cold in column 5, Table I.

TABLE II.—THE BEHAVIOR OF A PREVIOUSLY-HEATED ALUM SOLUTION IN THE PRESENCE OF NEUTRAL PAPER FIBERS.

Sample [c]	pH [a] of mixtures of 1 g. of fibers with 70 cc. of previously-heated [b] alum solution (0.0031 g. alum per 70 cc). pH before addition of fibers = 3.7 [b]: before heating the mixtures	after heating the mixtures
11 Rag	4.6	4.5
22. Soda-sulphite	5.2	5.3
28. Special sulphite	4.7	4.7
32. Bleached sulphate	5.0	5.0

[a] All pH measurements were made at 25 deg. C.
[b] This solution had a pH of 4.7 before heating, and was further hydrolyzed to pH = 3.7 by heating for 1 hr. at 100 deg. C., after which further heating caused no appreciable change in pH.
[c] The numbers are the same as in Table I, in which the samples are more fully described.

The four mixtures of hydrolyzed alum solution and fibers were then heated for 1 hr. at 100 deg. C., cooled, and the *pH* was determined. The results, listed in column 3 of Table II, reveal that little or no change in *p*H had occurred upon heating. Thus, since the hydrolyzed alum solution was known to contain relatively large amounts of hydrogen ion, as shown by the *p*H of 3.7, and since the fibers added were found to remove relatively large quantities of hydrogen ion from solution, the fact that subsequent heating of these mixtures resulted in no decrease in *p*H shows that no appreciable hydrogen ion was released by the fibers during the process. It appears, therefore, that such a release of hydrogen ion, if it occurs, cannot explain the *p*H changes encountered in the method of hot extraction.

Although the mixtures of hydrolyzed alum solution and fibers were rather more acidic than usual, these higher concentrations of strong acid were not effective in producing organic acids during the heating process in amounts large enough to affect the measured *p*H appreciably.

Behavior of Alum Solutions in the Presence of Fibers

Although the simple fact that alum solutions undergo decreases in *p*H upon heating makes it appear reasonable that the alum used in the manufacture of paper is responsible for the observed *p*H change occurring when paper-water mixtures are heated, it remains to be shown that *p*H changes of the expected order of magnitude occur in alum solutions when fibers are present.

That the presence of fibers affects the hydrolytic process is shown by the following. From the details of a typical papermaking run[2], e.g., paper 13, Table

[2] In this run, the proportions were 32 cu. ft. of water to 1.2 lb. of papermakers alum and 58 lb. of fibers and clay; 1.5 g. of machine water remains with each gram of solid material until evaporated in the driers.

I, in which 2.1 per cent alum was used, it can be calculated that 1 g. of the finished paper would contain aluminum corresponding to 0.00091 g. of alum, if selective retention of aluminum ion by the fibers in the beater and chest were neglected. The *p*H-cold of a mixture of 1 g. of paper sample 13 with 70 cc. of distilled water was 4.9. When, however, 1-g. portions of samples nos. 11, 22, 28, and 32 (all largely free of alum) were added to 70-cc. portions of distilled water containing 0.00091 g. alum, the *p*H of the mixtures was much higher than 4.9 and the change in *p*H, if any, upon heating was small. In the absence of fibers, an alum solution containing 0.00091 g. per 70 cc. changed in *p*H from 4.9 to 4.1 upon heating. The results, given in Table III, columns 2 and 3, and footnote *a*, indicate that the reactions involved in the *p*H changes upon heating differ in the presence and absence of fibers. The results also indicate that the paper-water mixtures of Table I behaved differently upon heating than the mixtures represented in Table III, which consisted of the same kind and amount of fibers plus an amount of alum calculated upon the basis of no selective retention of aluminum. When the amount of alum was increased to 10 times the calculated amount, the *p*H changes upon heating, shown in columns 6 and 7, Table III, became similar to those in Table I. Such a large increase in the amount of alum, however, resulted in *p*H values which, even before heating, were abnormally low when contrasted with the values for *p*H-cold of Table I. Use of an intermediate amount of alum, columns 4 and 5, resulted in initial *p*H values which were normal, but gives *p*H changes upon heating which were smaller than those usually found in papers of this *p*H range.

TABLE III.—BEHAVIOR OF PREVIOUSLY UNHEATED ALUM SOLUTIONS IN THE PRESENCE OF NEUTRAL FIBERS

	pH of mixtures of 1 g. of fibers with 70 cc. of alum solutions					
	0.00091 g. alum per 70 cc. pH before addition of fibers=4.9 [a]		0.0031 g. alum per 70 cc. pH before addition of fibers=4.7 [a]		0.0091 g. alum per 70 cc. pH before addition of fibers=4.5 [a]	
Sample	before heating mixtures	after heating [b] mixtures	before heating mixtures	after heating [b] mixtures	before heating mixtures	after heating [b] mixtures
11. Rag	5.9	6.1	4.9	4.6	4.5	3.7
22. Sulphite-soda	6.1	5.9	5.6	5.3	4.6	4.2
28. Special sulphite	5.8	6.0	5.0	4.7	4.5	3.8
32. Bleached sulphate	6.0	6.0	5.2	4.9	4.5	3.9

[a] The three solutions containing 0.00091, 0.0031, and 0.0091 g. alum per 70 cc. had pH values upon cooling of 4.1, 3.7, and 3.4, respectively, after heating for 1 hr. at 100 deg. C. without fibers present at any time.

[b] All pH determinations were made at 25 deg. C.

It is evident that the fiber-alum-water mixtures just discussed differ in an important manner from the paper-water mixtures of Table I, in that, in the former, the *p*H changes upon heating are too small if the *p*H-cold is normal, or in that the *p*H-cold is too low if the changes in *p*H upon heating are normal. The cause of this difference will be considered in the next section. The data presented thus far, however, allow some deductions to be made concerning the nature of the reactions occurring in the fiber-alum-water mixtures.

The data of Table III raise three important questions: (a) do fibers raise the *p*H of alum solutions by taking up only hydrogen ion, or is aluminum also retained and the acidity thus indirectly reduced? (b) Why is the rise in *p*H, brought about by the addition of fibers, large in the weak and hardly noticeable in the stronger solution of alum? (c) Why is the change in *p*H upon heating alum solutions much less in the presence of fibers than in their absence?

Do Fibers Raise the pH of Alum Solutions

(a) Relatively large amounts of unhydrolyzed aluminum are present, before heating, at the three concentrations described in Table III. This was shown by the fact that heating greatly changed the *p*H. The approximate amount of unhydrolyzed aluminum can be calculated from the data at hand. If the hydrolysis reaction[3] is simply written as:

$$Al^{+++} + 3HOH = Al(OH)_3 + 3H^+$$

then the degree of hydrolysis is represented by the expression:

$$\frac{\text{concentration of hydrogen ion}}{\text{concentration of hydrogen ion at complete hydrolysis}}$$

For the weakest, most hydrolyzed, solution, the degree of hydrolysis is 11 per cent, as calculated from the *p*H of 4.9 and the concentration of alum = 0.00091 g. per 70 cc. = 0.000117 equivalents per l., showing that 89 per cent of the aluminum was unhydrolyzed in this solution before heating.

The simplest expression for the hydrolysis constant for the chemical equation (1) as written is

$$\text{Hydrolysis} = \frac{(H^+)^3}{(Al^{+++})} \qquad (1)$$

Substituting the three independent sets of data, for the three solutions, into this expression, the values obtained are 0.6×10^{-10}, 0.7×10^{-10}, and 0.6×10^{-10}, in the order of concentration of the three alum solutions of Table III. The agreement may be considered as a measure of substantiation of the correctness of the hydrolysis equation as written.

Inasmuch as the removal of aluminum ion by the fibers would cause the reversal of the hydrolysis reaction, thus reducing the hydrogen ion concentration and raising the *p*H, it is desirable to know if such a removal occurs.

Schwalbe *(6)* showed that a sulphite pulp reduced the concentration of aluminum in an alum solution. His results were confirmed in the present work by the following experiments.

Samples of the basic materials, from which the papers listed in Table I were made, were added in 1-g. portions to 70-cc. portions of alum solution containing 0.0031 g. $Al_2(SO_4)_3 \cdot 18H_2O$ per 70 cc. The basic materials, rather than the papers, were used, with the exception of sample 22 (*see* footnote c, Table I), in order to avoid large amounts of aluminum, present as clay in samples 11, 28 and 32. These basic materials were found to have the same *p*H as the corresponding papers, with the exception of the special sulphite pulp, which was alkaline, but which became neutral upon washing twice with distilled water. They were found, furthermore, to have essentially the same effect upon the *p*H of alum solutions as the corresponding neutral papers, samples 11, 28 and 32. The aluminum in solution was determined with the sensitive colorimetric aurintricarboxylic acid method before and after the addition of the fibers. The sulphate was determined in the same solutions by

[3] It is recognized that aluminum ion may hydrolyze in steps, but the equation as written represents the sum of these steps.

precipitation with barium[4]. The results given in Table IV show that extensive retention of aluminum ion occurred in all cases, since the changes shown are much larger than the indicated probable experimental error. The conclusions regarding the retention of

TABLE IV.—RETENTION OF ALUMINUM BY FIBERS IN AN UNHEATED ALUM SOLUTION [a]

Fibers (1 g. per 70 cc. of solution	Aluminum concentration: Before addition of fibers mg. per 70 cc. ±0.02 mg.	Aluminum concentration: After addition of fibers [b] mg. per 70 cc. ±0.02 mg.	Sulphate concentration: Before addition of fibers mg. per 70 cc. ±0.2 mg.	Sulphate concentration: After addition of fibers [b] mg. per 70 cc. ±0.2 mg.
A) New rags (half stuff)	0.27	0.17	1.3	1.6
B) Soda-sulphite (sample 22)	0.27	0.10	1.3	1.6
C) Special sulphite pulp	0.27	0.03	1.3	1.2
D) Bleached sulphate pulp	0.27	0.02	1.3	1.4

[a] The alum solution was made by dissolving 0.0031 g. C.P. $Al_2(SO_4)_3.18H_2O$ per 70 cc. Upon analysis, the salt was found to have lost water and was better represented by the formula $Al_2(SO_4)_3.16H_2O$.

[b] All fibers were removed by filtration and dissolved organic matter was removed before the analyses. All $Al(OH)_3$ not retained by the fibers but removed in the filtering process would constitute a small correction of the values of column 3. The correction is probably negligible since not more than 5 per cent of the Al would be present as $Al(OH)_3$, as shown by the value for the degree of hydrolysis (5 per cent), for this concentration of aluminum sulphate.

sulphate ion are less definite, for these experimentally determined changes are as large as the experimental uncertainty, and it is not possible to decide from these data whether or not selective retention occurs to a small extent. The data show, however, that aluminum sulphate is not retained as $Al_2(SO_4)_3$, since one part by weight of aluminum would therein be associated with over 5 parts by weight of sulphate. The slight gains, if real, in sulphate ion by the solutions are apparently due to the presence of sulphate, 0.05 to 0.15 mg., known *(7)* to be present per g. of such fibers. The fact that aluminum is selectively retained is of major importance, since the amount of aluminum in paper calculated solely upon the basis of concentrations in the beater would not be large enough to explain the observed *p*H changes upon heating.

The experiments just described do not, by themselves, indicate the form in which the aluminum is retained. It may be retained either (1) as completely hydrolyzed $Al(OH)_3$ or (2) as unhydrolyzed Al^{+++} or as partially hydrolyzed $Al(OH)^{++}$, e.g., or both. In any case, the substances may be either physically adsorbed as such, or in some chemical combination with the organic or inorganic constituents of the fibers. Since physical adsorption would require that the sum of the ions, positive and negative, be zero, and since the concurrent removal of SO_4 has not been shown, the retention of Al^{+++} as such, or its partially hydrolyzed forms, would be explainable by an ion exchange with the inorganic fiber-constituents, e.g., calcium. The mechanism of retention was not investigated.

If the aluminum were retained only as $Al(OH)_3$, however, then practically all of the aluminum in the system, at least in the cases of C and D, Table IV, would be in a completely hydrolyzed condition before heating. The amount of unhydrolyzed aluminum, Al^{+++}, then would be insufficient to explain the *p*H changes upon heating, as shown in Table III, columns 4 and 5. It appears, therefore, that the retention of hydrolyzable aluminum must occur.

These conclusions are necessary according to the theory which requires that the activity or mass-action effect of solid substances, in equilibrium with a solution, is unity, and that the amount of the solid phase present does not affect the ionic equilibrium. This means that $Al(OH)_3$ may be taken up by the fibers without upsetting the ionic equilibrium, and without consequent formation of more $Al(OH)_3$. Thus, only 11 per cent or less of the aluminum present in the three solutions under consideration could be removed from solution, if removed only as $Al(OH)_3$. Table IV shows this value to be greatly exceeded in all cases.

Additional evidence of the removal of aluminum by fibers is given in Table V. After fibers had been in contact with an alum solution for 1 hr., they were removed completely, and the filtrates were heated for 1 hr. at 100 deg. C. as usual, and cooled. Measurement of the final *p*H showed that the *p*H changes, and especially the changes in hydrogen ion concentration of the filtrates upon heating were much smaller than in the original solution, showing that hydrolyzable aluminum had been removed from solution. It should be stated that filtrates from mixtures of the fibers with distilled water alone, containing no alum, did not change in *p*H upon heating.

TABLE V.—CHANGES IN pH OF THE FILTRATES FROM FIBER-ALUM-WATER MIXTURES

Sample	pH of mixtures of 1 g. fibers + 70 cc. water + 0.0031 g. alum pH before addition of fibers = 4.7 [a]	pH of filtrate before heating	pH of filtrate after heating	Change in H^+-concentration upon heating filtrates $\times 10^{-7}$
11. Rag	4.9	4.7	4.1	600
22. Soda-sulphite	5.6	5.6	5.3	25
28. Special sulphite	5.0	4.8	4.5	155
32. Bleached sulphate	5.2	5.2	4.7	140

[a] The solution after heating alone had a pH of 3.7. The change in pH from 4.7 to 3.7 represents a change in hydrogen ion concentration of 1800 $\times 10^{-7}$ equivalents per liter.

[b] All pH measurements were made at 25 deg. C.

Why is the Rise in pH Large

(b) In answer to the second question, it may be pointed out that the percentage of aluminum ion left in solution after retention becomes larger with an increase in the total amount, since the fibers approach "saturation". As the total amount of alum was increased, Table III, the proportion left in solution became larger, until, in the strongest solution, sufficient alum remained in solution to maintain the *p*H at the original value, except in the case of the soda-sulphite fibers. Even in the strongest solution, as much as ¼ of the aluminum ion may have been retained by the fibers, since the hydrolysis relationship, $(H^+) = K\sqrt[3]{(Al^{+++})}$, shows that large changes in the concentration of aluminum must occur before the *p*H changes become appreciable.

Why is the Change in pH Much Less

(c) In answer to the third question, there are two mechanisms which may be considered, to explain the fact that *p*H changes upon heating alum solutions are smaller in the presence than in the absence of fibers. Either the aluminum taken up by the fibers is not hydrolyzed by heating and only the aluminum in solution is, or else all, or most, of the aluminum ion hydrolyzes, but the acid produced is subsequently taken up by the fibers. The latter appears more likely, however, for the values in Table II, column 2, which were obtained by first hydrolyzing the aluminum and then reducing the acidity by adding fibers, are in good agreement with the values in Table III, column 5, which were obtained by heating the alum

[4] The author wishes to thank W. D. Mogerman and W. W. Walton of the Chemistry Division for cooperation in making these analyses.

in the presence of fibers. This speaks in favor of the mechanism that all or most of the aluminum in the system is hydrolyzed upon heating, and the hydrogen ion produced is retained to an extent depending upon the nature of the fiber and upon the concentration of the acid.

Retention Phenomena Under Papermaking Conditions

The conditions of the experiments thus far described simulated conditions of paper extraction and were useful in showing the behavior of acid and alum occurring therein. The concentrations of materials during papermaking conditions are much different, however, than during extraction conditions In a typical papermaking run, for a paper made with a medium amount of alum, 1.4 per cent, e.g., 1 g. of fibers in the beater and chest is associated with 35 cc. of water containing 0.014 g. of alum. This concentration is over three times as great as that of the strongest solution of alum referred to in the preceding section, which contained 10 times the amount of alum calculated on the basis of no retention, for extraction conditions of paper sample 13 of Table I. Thus, the amount of aluminum retained under these papermaking conditions may be expected to be large.

On the basis of the foregoing experiments, such large amounts of alum would be expected to result in much lower values for *p*H-cold than those of Table I. In the foregoing experiments, however, distilled water was used, whereas the papers of Table I were made, as usual, with tap water of *p*H of 7.6, to which much more alum must be added than to distilled water, for a given resultant *p*H. For example, 70 cc. of tap water containing 0.028 g. of alum, and 70 cc. of distilled water containing 0.0091 g. of alum, both have a *p*H of 4.5.

The proportions in a typical papermaking run were simulated with rag and with soda-sulphite paper fibers. One-gram portions of fibers were added to 35-cc. portions of tap water containing 0.014 g. of alum each. After 1 hr. at room temperature, the mixtures were filtered on a Büchner funnel, and allowed to remain thereon until the pads contained 1.5 g. of liquid, which corresponds to the moisture content of the paper sheet before it reaches the drier.

Concentration of alum solution due to evaporation under these conditions was found to be negligible, since prolonging the time of the operation from the usual minute or so required, to 2 min. did not change the weight of the moist pad to an important extent: less than 5 per cent of water was thereby lost.

The pads were then mixed with 68.5 cc. of distilled water, to simulate extraction conditions, and the *p*H-cold was determined after 1 hr. at room temperature. The mixtures were then heated for 1 hr. at 100 deg. C., cooled, and the *p*H-hot was determined. The results are given in Table VI, systems 1, 2 and 3, and show that paper extraction conditions for unsized papers were thus reproduced, in that both the *p*H-cold and the change in *p*H upon heating were within the normal range.

TABLE VI.—pH RELATIONSHIPS UNDER PAPERMAKING AND EXTRACTION CONDITIONS

Fibers:	Rag, No. 11	Soda-sulphite mixture, No. 22
System:	pH values [a]	
1. 1 g. fibers + 35 cc. tap water containing 0.014 g. alum	4.6	5.0
2. Fibers filtered, retaining 1.5 g. liquid; 68.5 cc. distilled water added to fibers	5.0	5.8
3. System "2" heated for one hour at 100 deg. C., then cooled	4.4	5.0
4. 1.5 g. of original solution of 0.014 g. alum in 35 cc. tap water, added to 68.5 cc. distilled water containing 1 gram of fibers	6.4	6.5
5. System "4" heated for one hour at 100 deg. C., then cooled	6.4	6.1

[a] All pH values measured at 25 deg. C.

The retention of aluminum ion under papermaking conditions was found to be considerable, as shown by the data in Table VII, whereas that of sulphate ion was small, if it occurred at all. The amounts of aluminum and sulphate[4] remaining in the fibers after exposure to tap water and to tap water containing alum were determined after igniting the materials. The ignition of the materials for sulphate analysis required special care. The materials were soaked in an excess of calcium chloride solution, and the mixture was evaporated to dryness and then ignited at 950 deg. C., at which temperature $CaSO_4$ is stable. Blanks were run on all reagents. The presence of aluminum in the form of clay was again avoided by the use of the basic rag material from which sample 11 was made. The two last columns show that from ⅓ to almost ½ of the aluminum added to the beater is selectively retained, even in the absence of rosin size, whereas 96 per cent of the aluminum would remain with the machine water if no selective retention occurred.

It was of interest to determine the *p*H relationships if no retention were allowed to take place. This was done as follows. 1.5 g. of the original tap water-alum solution was directly added to 68.5 cc. of distilled water containing 1 g. of fibers. This amount of alum would be the same as that in solution in the 1.5 g. of liquid in the fibers, if retention of aluminum ion by the fibers had not occurred. It was found, however, that not only was the *p*H of the mixtures made up by direct addition of alum solution much higher, but also the change in *p*H upon heating was much smaller, than in the mixture made up in the previous manner, by allowing 1.5 g. of liquid to remain with the fibers. The results are given in the remainder of Table VI.

TABLE VII.—RETENTION PHENOMENA UNDER PAPERMAKING CONDITIONS

	Gain for 1 g. of fibers exposed [a] to 35 cc. of tap water containing 0.014 g. alum [b]		Gain for 1 g. of fibers exposed [a] to 35 cc. of tap water, no alum		Gain, net, due to alum		Gain, if no retention occurred, calculated from moisture [a] in fibers after filtration		Proportion of substances removed from alum solution by fibers	
Fibers	Al mg. ±0.01 [c]	SO_4 mg. ±0.1	Al mg. ±0.01	SO_4 mg. ±0.1	Al mg. ±0.01	SO_4 mg. ±0.1	Al mg.	SO_4 mg.	Al per cent	SO_4 per cent
A New rags, half stuff	0.45	0.5	0.06	0.1	0.39	0.4	0.05	0.3	33	6
B Soda-sulphite, no. 22	0.64	0.5	0.10	0.1	0.54	0.4	0.05	0.3	45	6

[a] Fibers remained in the solution 1 hr. with constant stirring and were then filtered with suction until 1.5 g. solution remained with each gram of fibers.

[b] 0.014 g. alum = 1.19 mg. aluminum and 6.3 mg. sulphate.

[c] The experiments were actually performed with 2.5 g. of fibers and corresponding amounts of liquid, for which the analytical precision was 0.02 and 0.2 mg. for aluminum and sulphate, respectively.

Effect of Rosin upon pH Relationships

It has already been pointed out that the addition of rosin size decreases not only the acidity of a paper, but also decreases the change in hydrogen ion concentration upon heating the paper-water mixture, for papers made with 2 per cent or more of alum. Since alum is always used in excess over the amount necessary to precipitate the rosin completely, this appears to be due to a reduction in the amount of available alum, presumably by the formation of insoluble aluminum resinate, as the following experiments show. Typical paper-water mixtures, referred to in Table I, were filtered after they had stood for 1 hr. at room temperature. These filtrates were then heated for 1 hr. at 100 deg. C. and then cooled. The *p*H was determined before and after heating. A decrease in *p*H was found only for the filtrates from papers made with relatively large quantities of alum. The results are given in column 10 of Table I. The effect of rosin upon the amount of alum leaving the fibers and dissolving into cold water is seen in the sample pairs 1 and 2, 3 and 4, and 12 and 13.

Other effects of rosin upon the *p*H and *p*H changes during heating may, of course, occur, for no attempt has been made to extend the investigation to cover this point. It is to be observed, however, that if such effects exist, they are small, since no systematic difference between the behavior of sized and unsized papers in Table I is noticeable, from the standpoint of *p*H. The decreasing effect upon the acidity and acidity changes during heating, by increasing the amount of size used, is obviously not a direct function of the weakly acidic character of rosin itself.

Fundamental Basis for Choosing Between Hot and Cold Extraction

It has been shown that the effect of hot extraction is to hydrolyze further the aluminum in the papers, thereby producing as much as 3 to 4 times the amount of acid originally present in the cold extract. These large amounts of acid resulting from the hydrolysis of aluminum ion obscure the presence of smaller amounts of other acids which may result from cooking or bleaching operations, or which may be present due to acidic atmosphere.

Hot extraction has a further serious drawback. Papers may undergo partial hydrolysis of the alum, with the liberation of harmful acid, when they are stored or shipped under warm, humid conditions, or when the drying or other manufacturing processes were faulty. The amount of this acid cannot be measured by the method of hot extraction, since the heating process causes extensive further hydrolysis, irrespective of any partial hydrolysis which may already have occurred. The method of cold extraction, on the other hand, gives *p*H values corresponding to the hydrolysis equilibrium at room temperature; thus, any displacement of this equilibrium by previous higher temperatures will be measured. If the alum was already partially hydrolyzed by faulty storage or manufacturing conditions, the acid thus liberated should be and is measured in the unheated extract.

If the acidity of a paper, as it exists under conditions of use, can be employed as a measure of permanence of paper, and it appears that this is true, then the method of cold extraction gives a much closer measure of the significant *p*H values of papers than do the more complicated methods now in general use.

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Review Of Paper Industry Literature

Copies of United States Patents can be obtained from the United States Patent Office, Washington, D. C. for 10 cents each. Send currency, not stamps.

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converted into viscose which was spun into yarn. The yields of unbleached pulp were 40 to 43 per cent, compared with 42 per cent for longleaf pine under similar conditions. The bleached pulps contained 89 to 91 per cent of alpha-cellulose, and had a cuprammonium viscosity of 20 to 40 centipoises, a copper number of 2.3 to 3.0, and brightness values of 82 to 87. Shredding and ageing were more rapid than with coniferous soda pulps. Xanthation and dissolution were satisfactory, but the solutions were hazy. The strengths and extensibilities of the yarns were equal to those from commercial pulps. Mixtures of hard and soft woods were satisfactorily processed.—A.P.-C.

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Indian Paper Industry. Indian Print and Paper 4, no. 3:36-37 (March, 1939); B. I. P. C. 9:458.—The first machine-made paper produced in India was made in Serampore near Calcutta about 1874; prior to that date a flourishing hand-made paper industry was in existence for many centuries. Grass and rags were the principal raw materials used up to 1925, when serious efforts were made to produce a suitable pulp from bamboo. The technical difficulties of bamboo have now been overcome; a brief description of the process and method used for the production of paper from mixed bamboo and grass pulps is given. The bamboo, cut into suitable lengths is carried to a crusher which cuts and crushes it into small chips. It is digested in a liquor consisting of caustic soda and sodium sulphite. The Sabai grass is treated in a similar way as esparto, using caustic soda as digesting liquor. The grass and bamboo pulps are mixed in a beater and beaten for various periods, depending upon the grade of paper to be made; the remainder of the papermaking processes is similar to that of any other wood-pulp or rag paper.—C.J.W.

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ence is made to the manufacture of different types of fancy coated papers, such as batique or Java paper, gelatine paper, marble paper, crinkled paper, metallic paper, air-brush paper, high gloss friction-calendered papers, and different kinds of papers used in bookbinding, such as ice paper, satin paper, wood grain paper, leather paper, moiré paper, velvet paper, etc.—C.J.W.

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Manufacture of Coated Paper. E. Arnould. Industrie Papetiere 17: 179-183 (Oct., 1938).—A brief outline of the principal qualities required of coated papers and of the various types of furnishes which can produce paper possessing these qualities.—A.P.-C.

TAPPI Notes

More than 900 attended the recent annual meeting and 25th Anniversary of the Technical Association of the Pulp and Paper Industry at the Roosevelt Hotel in New York City. All of the papers presented, together with those presented at the Syracuse convention will be published, together with a stenographic report of the discussions in a cloth-bound volume by the Association and distributed this spring to members and others interested.

T. T. Dunn, formerly chief engineer of the Gaylord Container Company, Bogalusa, La., is now assistant general superintendent of the Union Bag and Paper Company, Savannah, Ga.

G. A. Albert, formerly of the Phenolite Company, is now with the National Vulcanized Fiber Company, Yorklyn, Del.

R. S. Duell has been transferred from the Chicago office to the Hudson Falls plant of the Union Bag and Paper Corporation.

E. W. G. Cooper, formerly with the Crown Willamette Paper Company, Camas, Wash., is now with the Australian Paper Mills, Ltd., in Tasmania.

A. S. Hocker, formerly of the S. D. Warren Company, Cumberland Mills, Me., is now with the Clays and Paper Research Laboratory, New York, N. Y.

Andreas Christensen, formerly of the British Columbia Pulp and Paper Company, Vancouver, B. C., is now with the Fiber Making Processes, Inc., Chicago, Ill.

The Pulp Bleaching Corporation has moved from Orange, N. J., to Wausau, Wis.

The Delaware Valley Section of TAPPI will meet at the Engineers Club, Philadelphia on March 8. J. J. Thomas of Rohnm & Haas will speak on "The Use of Enzymes in Paper Manufacture."

The next national meeting of the Technical Association will be held at the Olympic Hotel, Seattle, Wash., on August 20-23, 1940. A special train will leave Chicago on Friday, August 16.

Sinclair & Valentine Co. Joins TAPPI

Sinclair & Valentine Company, who are this year celebrating their fiftieth anniversary as ink manufacturers has become a sustaining member of the Technical Association of the Pulp and Paper Industry.

S. and V., over a period of years have built up a nation wide and international service in manufacturing a complete line of printing, lithographic, gravure, aniline and coating inks. They have nineteen plants and service branches in the United States, four in Canada and a number of agencies in foreign countries.

At their home office in the main factory located at 611 West 129th street, New York, N. Y., they maintain complete research laboratories where work on original and fundamental problems is done. They have a capable staff of technicians for developing all types of inks and coatings for use on the various printing surfaces and the machines necessary to test them in practical application. They also manufacture dry and pulp colors and varnishes.

Because of the greatly intensified efforts on the part of the Technical Association in promoting research and a better understanding of the mechanism of printing on the part of the papermaker, inkmaker and printer, it is pleasing to have the Sinclair and Valentine Company enter into this important cooperative effort.

TAPPI Fall Meeting at Seattle

A feature of the recent annual meeting of the Technical Association of the Pulp and Paper Industry was the exhibits showing interesting details concerning the train trip that a large number of TAPPI members will make in August 1940 when they visit the Pacific Coast to attend the fall meeting of the Association. About one hundred members indicated at the reservation booth that they would attend, many indicating further that they would bring their wives with them.

An entire train to be known as the TAPPI Special will leave Chicago at 11 P.M. Friday, August 16. In an attempt to recognize the limited time some members may have at their disposal, arrangements have been made for only one stop enroute. This to witness a command performance of a famous Montana Rodeo. All Pullman and dining cars will be air-conditioned. Special low rate fares will prevail and although the official route to the West will be the Northern Pacific, the return trip can be made over any route, such as, the Canadian Pacific, the Southern Pacific, or intervening lines. The round trip standard rail fare from Chicago (by any choice of routes) will be $90.30. Reservations should be made early through William Geiger, Chairman of the Transportation Committee, 400 West Madison street, Chicago, Ill.

Pacific TAPPI Discusses Sulphite Liquor

The Pacific Section of the Technical Association of the Pulp and Paper Industry met at the Heathman Hotel, Portland, Ore. on March 5, 1940.

Prof. Leo Friadman of Oregon State College, Corvallis, Ore. talked on "Recent Advances in the Chemistry of Lignin."

Cecil L. Triplett of the Hawley Pulp and Paper Company, Oregon City, Ore. talked on "A Routine Test for the Organic Matter in Sulphite Liquors."

Ohio TAPPI to Meet

The Ohio Section of the Technical Association of the Pulp and Paper Industry will meet at the Manchester Hotel, Middletown, Ohio at 6:30 p.m. on Saturday, March 16th. The speaker will be Douglas Robbins of Middletown who will talk on "Vortraps and Their Uses in Pulp and Paper Mills."

Some Aspects of White Water Flocculation*

By Edward N. Poor[1]

Abstract

The flocculation of white water containing highly filled solids is discussed. A comparison of the action of various chemical treating agents is given. It is demonstrated that the formation of gelatinous compounds promoting flocculation is not essential. It is claimed that the efficiency of flocculating agents is, to a great extent, dependent upon rates of ionization. Fillers of the aluminum, magnesium silicate, and titanium types are discussed. The effect of wetting agents on the flocculation of fillers is given.

Interest Has Expanded Greatly

Interest in the flocculation of the materials used in paper manufacture has assumed great proportions in recent years, particularly as a result of the development of equipment designed to utilize this property in the removal of these valuable materials from the white water of a paper machine.

Flocculation, as the word indicates, consists of the segregation of solid particles into flocs or large masses possessing characteristics permitting their separation. If the flocs are to be floated to the water surface, air is dissolved in the water and as the particles coalesce, is entrained in the masses. As conditions above the water change in regard to decreased air solubility, the aerated particles rise to the surface to permit insoluble air to escape. If settling is the separating process, specific gravity of the particles is utilized.

Object

This paper deals with the treatment of white water containing, in addition to cellulose fibers, certain hydrophilic materials such as clay, titanium dioxide, asbestine and talc. It was decided that treatment of such mixtures is representative of many industrial conditions today, and at the same time, presents more technical difficulties than those containing cellulose fibers only. As proportions of the fillers become large, certain inherent physical characteristics become evident, and flocculation exhibits itself in various aspects.

It has been found experimentally that the introduction of small quantities of filler (10-20 per cent of moisture-free fiber weight) enhances the tendency of the particles to agglomerate. This is attributed to the gelatinous nature of these materials promoting the adherence of particles to form flocs.

As the proportions of filler increase certain inherent and inhibiting properties, such as specific gravity and surface tension, become evident and flocculation tendencies are affected. This paper deals with such white waters containing up to 400 per cent filler by weight of dry fiber.

Results

Since the last paper *(1)* dealing with the subject at hand, about 600 different suspensions of fiber and filler have been investigated. In all of these the filler-fiber ratio was in excess of 3. The following observations have been made:

1. In highly filled white water the effect of fiber length and degree of hydration, if any, is not evident.
2. In the flocculation of white water two conditions are vital: the formation of the medium producing flocculation must be rapid, and the stability of the floc formed must be great.
3. The rates of action of four flocculating agents used vary to a great degree.
4. The fillers investigated, clay, titanium dioxide, asbestine and talc, vary in rapidity of flocculation by agents which form gelatinous compounds as the promoting medium.
5. With agents which do not form gelatinous compounds all fillers flocculate with equal rapidity.
6. The formation of a gelatinous compound is not essential.
7. Surface tension has a pronounced effect on completeness and rapidity of flocculating action.

Rapidity of Flocculant Formation

It has been stated that the rapidity of chemical action of the flocculating agent is important. In the commercial saveall, specifically the Adka type in this investigation, the reacting chemicals and air are injected into white water flowing at high velocity through a mixing nozzle. High initial mixing not only expedites floc formation, but assures a large proportion of the fine particles becoming involved in the chemical action at hand. The filler particles have a gravity twice that of water, and if all are not immediately attacked they may settle from the point of floc formation and not be recovered. With all the chemical agents considered, a few seconds elapse before the action proceeds sufficiently to produce adherence of the solid particles so that complete flocculation is not obtained. If mixing is continued difficulties with the stability of the floc formed are encountered, so high efficiency depends on an optimum balance between initial and succeeding agitation. In addition this balance is identified with each chemical agent used. Thus design and choice of chemical are closely associated.

Rapidity of decomposition of the treating chemicals not only has an effect on the completeness of flocculation but, also on flotation efficiency. More rapid action permits the entrainment of larger proportions of air in the flocs, resulting in a greater lifting force.

Flocculating Agents

Those that Form a Gelatinous Medium

Sodium hydroxide at pH below 7: The treatment with sodium hydroxide of white water containing sufficient alum to result in a pH 6-6.5 has proven somewhat satisfactory in the flocculation of highly filled suspensions. The action, at ordinary temperatures is slow, being accomplished in 3-4 minutes. At a pH of 5.5 where investigators have found the insolubility of the alumina floc to be a maximum, flocculation is even less rapid. As a result the efficiency of flotation is also seriously impaired. However, in this case, the floc formed is not actually the alumina type, as defined, for it is adulterated with varying amounts of aluminum abietate and free rosin. While small proportions of these adulterants are undesirable larger amounts as seen below, enhance the flocculating characteristics.

* Presented at the Annual Meeting of the Technical Association of the Pulp and Paper Industry, Roosevelt Hotel, New York, N. Y., Feb. 19-22, 1940.

[1] Member TAPPI, Chemical Engineer, W. C. Hamilton & Sons, Miquon, Pa.

Sodium hydroxide at pH below 7 plus commercial rosin size: The use of rosin size in amounts equivalent to 0.001 per cent rosin by weight of water, 1-2 per cent by weight of solids, with sodium hydroxide at a pH of 6-6.5 has a marked effect on flocculation. Rapidity of chemical action is increased by 25 per cent, and flotation is improved to a great extent. It seems logical that the flocs formed in this case are a combination of aluminum hydroxide, aluminum abietate, and free rosin. The greater rapidity of decomposition of the size over that of the hydroxide formation is suggested as the reason for improved efficiency.

Long chain fatty acid soaps: The most versatile of the agents which form gelatinous flocculants by reaction with the aluminum ion are long chain soaps. The advantages of these are:

1. Their reaction with aluminum is rapid, being accomplished in 1½ min. at ordinary operating temperatures.
2. The resulting aluminum compound is, in the first instance, highly gelatinous, enhancing the adherence of solid particles. Secondly, it is porous, permitting entrainment of large amounts of air; thirdly, it is very insoluble, resulting in the formation of large flocs with increased surface for segregation.

The soap treatment is equivalent to 0.001 per cent of water, 1-2 per cent by weight of solids. The flocculation, while being rapid, produces flocs possessing great stability to agitation thus making the balance between initial and succeeding mixing less delicate.

An Agent Which Does Not Form a Gelatinous Medium

Up to this point this paper has dealt with flocculation as a result of the formation of an insoluble gelatinous compound as the medium promoting it. The use of sodium hydroxide has exhibited the fact that such a compound is not essential; the most rapid and complete action thus far investigated has been obtained with this agent above a pH of 10, actually above the isoelectric point where the aluminum hydroxide has dissolved.

Solids ranging from 0-100 per cent filler are flocculated in 30-60 seconds. Action begins at pH of 9.5 and attains a maximum rate of pH of 10, excess of the agent apparently having no effect.

The most significant fact concerning the use of sodium hydroxide as opposed to the other agents investigated, is that all the fillers considered flocculate with equal rapidity. In other words, the inhibiting property previously mentioned, surface tension, has no effect in treatment of this type.

The mechanism of this chemical action is not readily explained. It appears logical that it is electrolytic, possibly a result of the repelling force of the aluminate ion causing the solid particles to come in contact with sufficient velocity to coalesce.

Flocculation of Fillers

In the flocculation of clay, titanium dioxide, asbestine, and talc, the same relative speeds of chemical action were found with the agents forming gelatinous compounds, namely, sodium hydroxide below pH 7 and long chain soaps. The times of reaction given below concern the latter.

Flocculation runs were carried out with distilled water, acidified to a pH of 6.0 with aluminum sulphate. High initial mixing of reacting chemicals was used followed by absence of agitation.

Clay and titanium dioxide were flocculated completely in 50-60 sec.; the magnesium silicate fillers, asbestine, and talc required 120-150 seconds. The flocs from the last two were small and clarity between the particles was distinctly less than in the clay flocculation.

Use of Wetting Agents

Investigation as to the reasons for the differences in behavior of the various fillers disclosed the possibility that the decreased wettability of asbestine and talc by water might be a factor. It was postulated that the use of a wetting agent to decrease the forces acting at the filler surfaces would be reflected in those flocculating characteristics which depend to some extent on mechanical adherence to gelatinous materials.

The wetting agents utilized consisted of the active anion type, e.g., metallic naphthalene sulphonates, and active cation as quartenary ammonium salts. The agents were used in concentrations ranging from 0.005-1 per cent by weight of water.

Flocculation with Sodium Hydroxide at *p*H Below 7.0 and Long Chain Fatty Acid Soaps

The use of the active anion type of wetting agent in talc and asbestine flocculation produced the following results:

1. Time of flocculation was reduced to substantially that of clay or titanium dioxide.
2. The flocs formed were larger than in the absence of the agents.
3. Tendency of the flocs to float was increased.
4. Maximum rapidity of flocculation occurred in the presence of 0.01 to 1 per cent wetting agent. Only slight changes in characteristics were produced with 0.005 per cent.

The use of the anion type with clay and titanium dioxide evidenced improvement only as concerns flotation of the flocs.

The active cation type of wetting agent appeared to be less effective than the anion active. In concentrations of 0.01 per cent of water, rapidity of flocculation of talc and asbestine was increased slightly, with some improvement in flotation. In higher concentrations, the action was retarded sufficiently to prevent complete flocculation.

Flocculation with Sodium Hydroxide at *p*H 10

The use of both types of wetting agents produced no visible changes in flocculating or floating characteristics of any fillers treated with sodium hydroxide at pH 10.

Conclusions

The conclusions resulting from this investigation are: Effectiveness of chemical flocculating agents depends, in a large measure, on rapidity of ionization.

The formation of a gelatinous insoluble compound as the medium promoting flocculation is not essential.

Surface tension has a great influence on the efficiency of flocculation and flotation, in gelatinous mediums.

Additional Information

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Effect of Acid Concentration and Temperature Schedule in Pulping Resinous Woods*

By G. H. Chidester[1] and J. N. McGovern[2]

Abstract

From pulping experiments at the Forest Products Laboratory it may be concluded that increasing the sulphur dioxide concentration and using lower temperatures together with a longer cooking time have a beneficial effect in pulping jack pine, Douglas fir, and southern pine. It was possible by using suitable conditions to reduce the quantity of screenings obtained from the heartwood of the various samples and to reduce this factor to a value sufficiently low to indicate a satisfactory degree of pulping for the whole wood containing ordinary quantities of heartwood. Some improvement was shown in the color, strength, and in the amount of screenings produced by the sapwood when cooked in the presence of heartwood. The effects were much less pronounced, however, than in the case of heartwood.

It is believed that the results are generally applicable to representative samples of jack pine pulpwood. Samples of Douglas fir up to 100 years of age and containing as much as 78 per cent heartwood were reduced to a satisfactory degree. However, it is possible that wood of extreme age would require further modification for complete reduction. In the case of southern pine, the data were obtained on only one thoroughly seasoned sample, therefore, the results should be considered only as indicative of a trend. Further studies are necessary, particularly for the southern pines and Douglas fir, to determine the extent to which growth variables might affect the results.

The fact that difficulties are encountered in attempting to prepare sulphite pulp under ordinary conditions from heart-containing resinous woods, such as the pines and Douglas fir, is well-known. The liquor turns black before the digestion is completed, precipitation often occurs, and the pulp is burned. A large amount of screenings and pulp of poor quality containing uncooked slivers is obtained. It is generally recognized that these difficulties are due principally to the heartwood and are variously attributed to lack of sufficient penetration of the liquor into the chips, lack of sufficient diffusion during cooking, and to more resistant lignin. The problem has been the subject of a large number of investigations and while the use of ammonium or sodium bisulphite liquors and other modifications have in some instances exhibited a satisfactory pulping action, the results with the customary lime base liquor have until fairly recently been far from encouraging.

Two reports of particular interest in that they show favorable results with lime base liquor have recently appeared. Schmid *(1)* in Germany reports favorable results with pine by the use of mild conditions, low temperatures and long cooking times. He shows that pine heartwood swells less than sapwood on treatment with sulphite liquor and as a result absorbs much less base and a relatively greater amount of sulphur dioxide. Decomposition of the sulphur dioxide into sulphur and sulphuric acid at high temperatures is given as an explanation of the difficulties encountered in pulping. The use of comparatively mild conditions apparently enabled absorption of the liquor components in more nearly normal proportions to give favorable results. Schmid points out the necessity of cooking to a low bleach requirement to avoid excessive screenings. A screenings value of 0.5 per cent is reported for a procedure involving vacuum and pressure impregnation, and a total time of 32 hours. Presumably, pulp could be obtained in about 18 hr. with screenings varying from 3 to 15 per cent, depending upon the degree of cooking. He concludes that resin in itself does not hinder pulping any more than in spruce.

In a study of the sulphite pulping of Douglas fir, Brookbank *(2)* found that slabwood containing 85 per cent sapwood could be pulped in 10 hr. at 140 to 145 deg. C. Greater difficulty was experienced in cooking heartwood alone owing to greater danger of precipitation, although screenings as low as 0.2 per cent were obtained in 14.75 hr. with a pulp bleach consumption of 19 per cent. Two explanations were offered: that the Douglas fir heartwood did not elevate the precipitation temperature as much as spruce, and that the resin might decompose the bisulphite.

It is the purpose of the present report to present somewhat similar results obtained during the past 3 years at the Forest Products Laboratory in which the individual effects of acid strength, maximum temperature, and the retention of sulphur dioxide by higher pressures in pulping resinous woods are shown more extensively.

Experiments undertaken in 1936 demonstrated the results obtainable from jack pine under a certain set of commercial operating conditions using a weak acid liquor and indicated the possibility of pulping the heartwood under more favorable conditions, including the use of strong acid liquor and a long time at low temperatures. This indication was later followed by further experiments to determine the minimum time required for the production of pulp with fairly strong acid with reasonably low amounts of screenings. The conditions found favorable for jack pine were then applied to Douglas fir and to southern pine and the experiments extended to show the effects of acid strength, maximum temperature, and the retention of sulphur dioxide by the use of higher pressures.

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TABLE I.—PROPERTIES OF JACK PINE PULPWOOD

Physical properties								Chemical properties									
				Density, moisture-free weight per green volume, lb. per cu. ft.								Pentosans		Solubility in—			
Shipment	Diam., in.	Age, yr.	Rings per inch		Dryness	Heartwood, % by volume	Summerwood, % by volume	Shipment	A-cellulose %	Cellulose %	Lignin %	Total %	In cellulose %	Alcohol benzene %	Ether %	1 per cent NaOH %	Hot water %
1479	6.6	35	5.3	25.6	....	26	..	1479 (heartwood)	39.3	55.2	25.5	13.2	11.1	7.5	5.2	16.7	4.2
								1479 (sapwood)	44.0	59.2	27.0	12.2	8.7	6.5	1.6	12.9	1.9
[1] 1504	6.3	41	13	26.8	54.3	29.5	28	[1] 1504	42.2	58.2	26.9	12.8	10.8	4.6	2.4	13.6	3.1

[1] Sample consisted entirely of butt logs of approximately the same diameter.

Results with Jack Pine

The experiments with jack pine were undertaken at the request of a commercial mill to determine the results obtainable in about 11 hr. with liquor containing 4.2 per cent total and 1.25 per cent combined sulphur dioxide and also under conditions considered to approach the optimum for lime base liquor. The conditions chosen for the latter case were liquors containing a relatively high percentage of sulphur dioxide together with a long time at relatively low temperatures without going too far from conditions possible commercially. Samples of wood representative of the available supply were furnished by the cooperating company.

The upper halves of fourteen 8-ft. bolts were chipped and mixed for the pulping of the whole wood and two other bolts were used for the samples of heartwood and sapwood. The properties of the wood are given in Table I (Shipment 1479). Both the physical and chemical properties appear to be fairly representative of jack pine. The heartwood gave considerably lower values for total cellulose, α-cellulose, and lignin than the sapwood, and higher values for pentosans and extractable material.

Penetration tests indicated the presence of bisulphite throughout 5/8-in. heartwood chips in 4½ hr. and in sapwood chips in 2½ hr. at 110 deg. C., using the weak acid liquor specified previously.

The digestions were made in a 50-lb steam-jacketed digester having a stainless alloy lining. The digester proper was charged with 5/8-in. chips prepared from the whole wood. Samples of similar chips of heartwood and sapwood were cooked separately at the same time in perforated alloy baskets placed in the digester. The results of the digestions are given in Table II. In both instances the digestion was carried nearly to exhaustion of the bisulphite.

It is evident from Table II that a remarkable reduction in screenings from the heartwood resulted from the stronger acid, lower temperatures, and longer time. Although the screenings from the sapwood were fairly satisfactory with the weak acid liquor and shorter time, an improvement is likewise noticeable. The screenings from the whole wood were reduced from 9.4 to 1.3 per cent and the bleach requirement from 17 to 10 per cent. A higher bursting strength but lower resistance to tear also resulted from the stronger acid, lower temperatures, and longer time. However, the most interesting effect shown by these results is the reduction in screenings from the heartwood and the corresponding reduction in screenings from the whole wood to a fairly satisfactory figure, indicating reasonably complete pulping.

Effect of Cooking Time

Having obtained this indication of a satisfactory pulping action the next step was to determine to what extent the time could be reduced. The wood used for this purpose was from a later shipment (1504) and consisted of butt bolts all approximately the same in diameter. The butt bolts contained slightly more heartwood and more extractives than did the upper portions of the trees and were therefore somewhat more difficult to pulp satisfactorily. Except for its slower rate of growth, properties of the wood from the later shipment are not greatly different from those of the first shipment (Table I).

The total sulphur dioxide in this series was 6.5 per cent and the maximum pressure 80 lb. per sq. in. The total time was decreased over a range from 17 to 11.8 hr. and the maximum temperature increased accordingly from 127 to 136 deg. C. to give

TABLE II.—CONDITIONS AND RESULTS OF COOKING JACK PINE WITH STRONG AND WEAK LIQUORS ON 11- AND 18-HR. SCHEDULES[1]

Wood	Total SO_2 %	Maximum temperature, deg. C.	Time to maximum temperature, hr.	Total time, hr.	Yield		Unbleached blue color, Ives parts	Bleach requirement %	Burst factor at 550 cc. freeness, pt./lb./ream	Tear factor at 550 cc. freeness, g./lb./ream
					Screened %	Screenings %				
Whole wood (26% heart)...	4.2	142	6.5	11	35.5	9.4	63	17	0.89	1.45
	7.0	130	10.5	18	41.4	1.3	68	10	.94	1.20
Heartwood	4.2	142	6.5	11	17.1	36.8	..	..	...	...
	7.0	130	10.5	18	45.1	2.2	..	..	1.08	1.25
Sapwood	4.2	142	6.5	11	47.1	1.2	..	..	...	...
	7.0	130	10.5	18	47.7	.4	..	..	1.02	1.50

[1] Combined SO_2, 1.25%; penetration, 4.5 hr. to 110 deg. C.; maximum pressure, 70 lb./sq. in.

TABLE III.—EFFECT OF DIGESTION TIME IN COOKING JACK PINE BUTT BOLTS WITH STRONG ACID[1]

Total time, hr.	Maximum temperature, deg. C.	Time to maximum temperature, hr.	Yield		Unbleached blue color, Ives parts	Bleach requirement, %	Burst factor at 550 cc. freeness, pt./lb./ream	Tear factor at 550 cc. freeness, g./lb./ream	Solubility in—	
			Screened %	Screenings %					Alcohol-benzene, %	Ether, %
17.0	127	10.5	47.1	1.7	68	10.2	0.88	0.90	2.3	1.5
15.5	130	10.5	47.6	1.3	68	10.2	1.00	.85	3.3	3.2
11.8	136	8.0	45.4	3.5	64	10.0	.84	.85	1.9	1.4

[1] Acid composition—6.5% total SO_2, 1.25% combined SO_2; penetration—2 hr. to 110 deg. C., held 2 hr. at 110 deg. C.; maximum pressure—80 lb./sq. in.

TABLE IV.—CHEMICAL ANALYSES OF DOUGLAS FIR AND SOUTHERN PINE

	A-Cellulose %	Cellulose %	Lignin %	Total pentosans %	Solubility in— Alcohol-benzene %	Ether %	1 per cent NaOH %	Hot water %
Douglas fir (tree 6)								
Heartwood	43.7	61.5	27.3	8.8	3.3	1.0	12.6	4.2
Sapwood	46.2	63.2	25.4	8.7	1.6	.4	12.7	5.0
Southern pine								
Heartwood	44.7	60.2	26.8	11.4	2.7	1.2	12.6	4.1
Sapwood	45.8	61.0	27.0	10.5	2.5	1.3	10.4	2.4

the same degree of cooking indicated by the bleach requirement. Each digestion was held nearly to exhaustion of the bisulphite. The results are given in Table III.

Considering 2 per cent screenings as an arbitrary maximum value, satisfactory pulping is evident under these conditions in about 15 hr. with a maximum temperature of 130 deg. C.

The strength of the jack pine pulps was perhaps equal that of a soft pulp from eastern hemlock and considerably lower than that of spruce pulp. The unbleached color, however, was appreciably lighter than unbleached eastern hemlock pulp. The ether solubility of the pulp was sufficiently high to give an indication of the possibility of pitch difficulty.

Results with Douglas Fir and Southern Pine

Having thus obtained satisfactory pulping of jack pine it was next desired to determine to what extent these results with lime base liquors would apply to Douglas fir (coastal type) and southern pine and to determine the separate effects of sulphur dioxide concentration and temperature schedule.

It had been found previously on other wood samples that heartwood and sapwood of both Douglas fir and loblolly pine were penetrated with calcium bisulphite if sufficient time were allowed. The approximate times required for indication of the presence of the bisulphite throughout sawn blocks of 5/8-in. chip dimensions (the sawn blocks require a longer time for penetration than chips of the same size) using liquor containing 5.6 per cent total sulphur dioxide with 1.3 per cent combined at a temperature of 110 deg. C. were as follows:

	Hours
Douglas fir heartwood	4.75
Douglas fir sapwood	3.25
Slash pine heartwood	7.50
Slash pine sapwood	4.25
Western hemlock heartwood	3.00
Western hemlock sapwood	3.00

The digestions were made in the same equipment as before. The digester proper was charged with Douglas fir chips from the wood of two trees classified as "young and slow growing". One of the trees, used for only one digestion, had a heartwood content of 45 per cent while that of the other was 72 per cent. Separate samples of Douglas fir and southern pine heartwood and sapwood were cooked at the same time in perforated alloy baskets placed in the digester.

The Douglas fir heartwood and sapwood samples were taken from a tree classified as "young and rapid growing" and having the following properties at the seventh bolt above the butt: age, 73 yr.; rate of growth, 7 rings per in.; heartwood content, 61 per cent; density, 27 lb. per cu. ft. (moisture-free weight/green volume). Chips obtained from 4-ft. bolts from the fourth to the twenty-fourth above the butt, which had been separated into heartwood and sapwood, were thoroughly mixed and samples taken for the different digestions. The chemical properties of the respective mixed chips of heartwood and sapwood are given in Table IV. The heartwood gave lower values for cellulose and alpha-cellulose than the sapwood and higher values for lignin and extractives. The chemical composition is probably fairly representative of young Douglas fir and is not particularly high in alcohol-benzene or ether extractives in comparison with spruce or the hemlocks.

The samples of southern pine heartwood and sapwood were taken from a piece of lumber from an old tree. The fact that it had been seasoned probably accounts for the low alcohol-benzene and ether solubilities of the heartwood.

The results of the digestions are given in Tables V, VI and VII.

The pulping of both Douglas fir and southern pine was materially aided by the higher sulphur dioxide content of the liquor and also by a decrease in the maximum temperature and rate of temperature rise to the maximum. The heartwood chips from the two species were not only more thoroughly cooked as evidenced by the smaller amounts of screenings and bleach requirements, but also yielded stronger pulps, especially with respect to bursting strength. Similar trends were shown for the sapwood, although the differences were much smaller owing to the greater ease of pulping sapwood under the less favorable conditions. Only the results obtained under these conditions are therefore presented for the sapwood.

TABLE V.—EFFECT OF SULPHUR DIOXIDE[1]

Wood	Total SO_2, %	Total time, hr.	Yield: Screened, %	Yield: Screenings, %	Unbleached blue color, Ives parts	Bleach requirement, %	Burst factor at 550 cc. freeness, pt./lb./ream	Tear factor at 550 cc. freeness, g./lb./ream	Solubility in— Alcohol-benzene, %	Solubility in— Ether, %
Heartwood—Maximum temperature, 130 deg. C.; time from 110 to 130 deg. C., 6 hr.										
Douglas fir	7.1	16.0	49.2	1.5	34	27	1.09	1.05	0.8	0.4
do	4.1	21.0	41.1	13.1	30	36	1.00	1.05	.8	.5
Southern pine	7.1	16.0	50.6	.9	38	37	.86	1.00	.9	.4
do	4.1	21.0	43.8	11.3	34	40+	.80	.90	1.5	.7
Heartwood—Maximum temperature, 145 deg. C.; time from 110 to 145 deg. C., 1.5 hr.										
Douglas fir	7.3	9.5	44.8	6.5	31	35	1.01	1.40	1.0	.2
do	4.1	10.0	36.5	18.0	24	40+	.91	1.10	.5	.5
Southern pine	7.3	9.5	45.6	7.3	34	40+	1.01	.85	1.9	.5
do	4.1	10.0	25.3	32.5	28	50+	.58	.95	.8	.5
Sapwood—Maximum temperature, 145 deg. C.; time from 110 to 145 deg. C., 1.5 hr.										
Douglas fir	7.3	9.5	46.4	.8	47	12	1.02	1.90	1.8	..
do	4.1	10.0	44.7	2.9	42	20	.94	1.35	.3	.4
Southern pine	7.3	9.5	49.2	.1	55	12	1.04	1.65	1.0	.3
do	4.1	10.0	48.8	.7	48	18	1.00	1.50	.4	.7

[1] Combined SO_2, 1.35%; penetration, 2 hr. to 110 deg. C., 2 hr. at 110 deg. C.; maximum pressure, 75 lb./sq. in.

TABLE VI.—EFFECT OF MAXIMUM TEMPERATURE[1]

Wood	Maximum temperature, deg. C.	Time from 110 deg. C. to maximum temperature, hr.	Total time, hr.	Yield: Screened, %	Yield: Screenings, %	Unbleached blue color, Ives parts	Bleach requirement, %	Burst factor at 550 cc. freeness, pt./lb./ream	Tear factor at 550 cc. freeness, g./lb./ream	Solubility in—: Alcohol-benzene, %	Solubility in—: Ether, %
Heartwood—Total SO_2, 7.2%											
Douglas fir	130	6.0	16.0	49.2	1.5	34	27	1.09	1.05	0.8	0.4
do	145	1.5	9.5	44.8	6.5	31	35	1.01	1.40	1.0	.2
Southern pine	130	6.0	16.0	50.6	.9	38	37	.86	1.00	.9	.4
do	145	1.5	9.5	45.6	7.3	34	40+	1.01	.85	1.9	.5
Heartwood—Total SO_2, 4.1%											
Douglas fir	130	6.0	21.0	41.1	13.1	30	36	1.00	1.05	.8	.5
do	145	1.5	10.0	36.5	18.0	24	40+	.91	1.10	.5	.5
Southern pine	130	6.0	21.0	43.8	11.3	34	40+	.80	.90	1.5	.7
do	145	1.5	10.0	25.3	32.5	28	50+	.58	.95	.8	.5
Sapwood—Total SO_2, 4.1%											
Douglas fir	130	6.0	21.0	46.6	1.9	45	15	.97	1.30	.1	.2
do	145	1.5	10.0	44.7	2.9	42	20	.94	1.35	.3	.4
Southern pine	130	6.0	21.0	50.5	.1	47	14	1.06	1.20	.6	.6
do	145	1.5	10.0	48.8	.7	48	18	1.00	1.50	.4	.7

[1] Combined SO_2, 1.35%; penetration, 2 hr. to 110 deg. C., 2 hr. at 110 deg. C.; maximum pressure, 75 lb./sq. in.

Effect of Sulphur Dioxide Concentration

In pulping the Douglas fir heartwood the sulphur dioxide concentration effect was in evidence at both high and low maximum temperatures (Table V). In both cases the higher sulphur dioxide content resulted in a decrease in screenings of about 12 per cent, a reduction in bleach requirement of about 11 per cent, and an increase in busting strength of about 0.1 point. The color of the pulp obtained with the stronger acid was lighter in all cases than that obtained with the weaker acid.

The higher sulphur dioxide content gave similar results with southern pine. The screenings and bleach requirement were both materially lower and the bursting strength was higher. In spite of the low alcohol-benzene and ether solubilities and the seasoning of the wood, the difficulty of pulping the heartwood under the less favorable conditions is evident from the excessive amount of screenings. Even though there appears to be no doubt of these trends being applicable to southern pine generally, further trials are necessary to determine their quantitative effects on representative samples of heart-containing pulpwood.

Effect of Low Maximum Temperature and Slow Temperature Rise

Table VI gives essentially the same data presented in Table V rearranged to facilitate comparisons with regard to the different temperature schedules. The improved results obtained by reducing the maximum temperature and rate of temperature rise were appreciable, but somewhat less than those obtained by the stronger acid. Lowering the maximum temperature from 145 to 135 deg. C. accompanied by a slower rate of rise reduced the screenings from the Douglas fir heartwood 5 per cent and the bleach requirement 8 per cent and gave higher bursting strengths. The improvements shown at the lower temperature were similar for both the high and low sulphur dioxide concentrations.

The results obtained from the southern pine by lowering the maximum temperature were again similar in trend to those from Douglas fir.

The results showing the effect of using higher pressure with the stronger acid for cooking the heartwoods are given in Table VII. The higher maximum temperature schedule was used to indicate any effect under the less favorable temperature condition. The cooking time was shorter for the higher pressure owing to the retention of sulphur dioxide. Both Douglas fir and pine gave lower screenings with the higher pressures, but the differences were less than the previously indicated effects of acid strength or temperature.

In a further study of the sulphite pulping of Douglas fir it has been found that the favorable conditions described in the foregoing reduced satisfactorily trees up to about 100 years old. However, a sample of wood representing an old, slow-growth type (364 years old and having 52.9 rings per in. for the middle bolt) gave about 13 per cent screenings. It appears, therefore, that further modification might be necessary to pulp satisfactorily material representative of this extreme.

The Douglas fir sapwood pulp was somewhat lighter in color than the heartwood pulp. Both exhibited a bright yellow color when fresh and in a wet condition, changing to a light brown when dry. The color of the dry pulp was darker than unbleached hemlock sulphite pulp. The bursting strength of the pulp was below that of western hemlock pulp, but the tearing strength was exceptionally high. The fibers were long and coarse, and tended to form a bulky sheet. The alcohol-benzene and ether solubility values are desirably low in all instances. The pulp could undoubtedly be used to produce those characteristics desirable for certain types of paper, and with suitable processing conditions as a substitute for other coniferous pulps. A mimeograph bond paper made at the Forest Products Laboratory from a sample of bleached pulp prepared from whole wood under the favorable conditions described above appeared as an insert sheet in the August 1938 number of the *Pacific Pulp and Paper Industry.*

Literature Cited

(1) Schmid, Erwin, *Papier-Fabr.* 36, no. 52:565-571 (Dec. 25, 1938).
(2) Brookbank, E. B., *Pac. Pulp Paper Ind.* 36, no. 52:17-26 (Nov., 1938).

TABLE VII.—EFFECT OF SULPHUR DIOXIDE RETENTION[1]

Wood	Maximum pressure, lb./sq. in.	Total time, hr.	Yield: Screened, %	Yield: Screenings, %	Unbleached blue color, Ives parts	Bleach requirement, %	Burst factor at 550 cc. freeness, pt./lb./ream	Tear factor at 550 cc. freeness, g./lb./ream
Heartwood—Total SO_2, 7.0 per cent; maximum temperature, 145 deg. C.								
Douglas fir	150	7.9	45.3	3.1	31	27	1.07	1.25
do	75	9.5	44.8	6.5	31	35	1.01	1.40
Southern pine	150	7.9	48.6	2.0	37	35+	.87	.95
do	75	9.5	45.6	7.3	34	40+	1.01	.85

[1] Combined SO_2, 1.35%; penetration, 2 hr. to 110 deg. C., 2 hr. at 110 deg. C.; time from 110 to 145 deg. C., 1.5 hr.

Imports of Paper and Paper Making Stock

Giving Manifests of New York, Boston, Philadelphia and Other Ports of Newsprint, Wrapping, Writing, Coated, Blotting, Tissue, Strawboard, Wallboard, Cigarette Papers, Sulphite, Kraft and Ground Wood Pulp.

NEW YORK IMPORTS

WEEK ENDING MARCH 2, 1940

SUMMARY

Cigarette Paper.....428 cs.
Wall paper.....1 cs., 12 bls.
Painting paper.....1 cs., 7 bls.
Printing paper.....15 cs.
Packing paper.....100 bls.
Filter paper.....4 bls.
Colored paper.....4 cs., 4 bls.
Surface coated paper.....63 cs.
Letter paper.....1 cs.
Design paper.....2 cs.
Miscellaneous paper.....11 cs., 1 ble.

CIGARETTE PAPER

Champagne Paper Corp., ——, Havre, 388 cs.
W. I. Chudleigh, ——, Havre, 40 cs.

WALL PAPER

T. N. Fairbanks, *Excambion,* Marseilles, 1 cs.
Hudson F'd'g Co., *Excambion,* Marseilles, 12 bls.

PAINTING PAPER

American Express Co., ——, Havre, 7 bls.
Titan Shipping Co., ——, Havre, 1 cs.

PRINTING PAPER

——, ——, London, 15 cs.

PACKING PAPER

J. P. Heffernan Paper Co., *Excambion,* Genoa, 100 bls.

FILTER PAPER

American Express Co., *Excambion,* Marseilles, 4 bls.

COLORED PAPER

C Asche Co., *Garnes,* Antwerp, 4 bls., 4 cs.

SURFACE COATED PAPER

Gevaert Co. of America, *Garnes,* Antwerp, 63 cs., (unfinished photo-paper).

LETTER PAPER

Globe Shipping Co., ——, Havre, 1 cs.

DESIGN PAPER

The Morilla Co., ——, Havre, 2 cs.

MISCELLANEOUS PAPER

American Express Co., ——, Havre, 8 cs.
G. E. Stechert, ——, Havre, 1 cs., 1 ble.
T. N. Fairbanks, *Sado Maru,* Yokohama, 2 cs.

RAGS, BAGGINGS, ETC.

Darmstadt Scott & Courtney, *Garnes,* Antwerp, 107 bls. old bagging.
Chase National Bank, ——, Havre, 207 bls. jute waste.
G. W. Miller & Co., Inc., *Noordam,* Rotterdam, 243 bls. old waste bagging.
Darmstadt Scott & Courtney, *Noordam,* Rotterdam, 76 bls. old waste bagging.
Schimmel Trading Co., ——, Shanghai, 45 bls. cotton waste.
Camden Fibre Mills, ——, Shanghai, 77 bls. cotton waste.
National City Bank, *Excambion,* Alexandria, 85 bls. bagging, 97 bls. old bagging.

CASEIN

American British Chemical Supplies, *Gro,* Buenos Aires, 3,333 bags, 174,980 kilos.
Balfour Guthrie & Co., *Gro,* Buenos Aires, 1,355 bags, 76,222 kilos.

PORTLAND IMPORTS

WEEK ENDING MARCH 2, 1940

Pagel Horton & Co., Inc., *Ragnhildsholm,* Sweden, 1,254 bls. wood pulp.

PHILADELPHIA IMPORTS

WEEK ENDING MARCH 2, 1940

H. S. Cramer & Co., *Donald McKay,* Buenos Aires, 250 bags casein.
Price & Pierce, Ltd., *Stegeholm,* ——, 1,287 bls. bleached sulphate, 120 bls. bleached sulphite.
Price & Pierce, Ltd., *Tulane,* ——, 500 bls. bleached sulphite.
M. Sone, *Ingerlise,* Sundsvall, 3,000 bls. wood pulp.
M. Sone, *Stegeholm,* Gothenburg, 475 bls. wood pulp.

BALTIMORE IMPORTS

WEEK ENDING MARCH 2, 1940

Darmstadt Scott & Courtney, *Executive,* Lisbon, 98 bls. old bagging.
Price & Pierce, Ltd., *Magna,* ——, 1,250 bls. unbleached mechanical pulp, 3,000 bls. unbleached sulphite, 300 bls., unbleached sulphate.
M. Sone, *Stegeholm,* Gothenburg, 1,255 bls. wood pulp.

NEW ORLEANS IMPORTS

WEEK ENDING MARCH 2, 1940

M. Sone, *Wasaholm,* Gothenburg, 2,400 bls. wood pulp.

LOS ANGELES IMPORTS

WEEK ENDING MARCH 2, 1940

——, *Yamabiko Maru,* Tokyo, 2 cs. writing paper.
——, *Yamabiko Maru,* Shanghai, 50 tons paper stock.
——, *Kamakura Maru,* Yokohama, 7 cs. hanging paper.

Pacific Forest Industries Must Desist

[FROM OUR REGULAR CORRESPONDENT]

WASHINGTON, D. C., March 4, 1940—At a meeting of the Federal Trade Commission held January 27, recommendations for the readjustment of the business of the Pacific Forest Industries, an export association were made, of which the following is an abstract:—

1. The Pacific Forest Industries cannot prohibit its members from selling plywood direct to exporters.

2. That the by-laws contracts and agreements to the contrary be rescinded between the Pacific Forest Industries and its members.

3. That no penalties may be imposed on the plywood sales to American exporters by its members.

4. That no resale prices by which such products will be sold can be fixed.

5. That the Pacific Forest Industries cease and desist from advertising that it is the sole export representative of the Plywood Mills which are its members.

Dee & Anderson Get New Line

[FROM OUR REGULAR CORRESPONDENT]

BOSTON, Mass., March 4, 1940—Dee & Anderson have become representatives of International Gum Tape Manufacturing Company, Inc., Brooklyn, N. Y., makers of all kinds of colored tape and the usual craft tape, made from strictly No. 1 Northern kraft with either a smoothed or ribbed gumming.

CONSTRUCTION NEWS

Deferiet, N. Y.—The St. Regis Paper Company, 230 Park avenue, New York, N. Y., has approved plans for new addition to branch mill at Deferiet, used for production of book, catalog and kindred paper stocks. It will be two-story, 70 x 150 feet, reported to cost over $60,000, with equipment. General contract for erection has been awarded to the Enos Construction Company, Herkimer, N. Y., and work is scheduled to be placed under way at once.

Kingsport, Tenn. — The Tennessee Eastman Corporation, manufacturer of acetate rayon products, has completed plans for new addition to local mill, consisting of a one and multi-story structure to be equipped for about 12 per cent increase in present capacity. Additional equipment will be installed in the cellulose department and other divisions. It is expected to begin erection at once, with completion scheduled early in the fall. Cost is reported in excess of $400,000, including machinery.

Neenah, Wis. — The Kimberly-Clark Corporation, manufacturer of wall papers, wadding, cover papers and other stocks, has closed bids on general erection contract for proposed new addition to mill at Neenah, and will make award at early date. New structure will be two-story and basement, 76 x 240 feet, reported to cost in excess of $100,000, with equipment. It will be used for expansion in wadding and other production divisions.

New Haven, Conn.—The National Folding Box Company, James and Alton streets, manufacturer of paper boxes and containers, has awarded contract to the E. & F. Construction Company, 94 Wells street, New Haven, for an addition to its bridge structure over James street. Work will be placed under way at once. No estimate of cost has been announced. Fletcher-Thompson, Inc., Fairfield, Conn., is architect and engineer.

Savannah, Tenn.—The Tennessee Valley Paper Mills, Inc., 720 Market street, Knoxville, Tenn., recently organized, is having plans completed by Hardy S. Ferguson & Co., 200 Fifth avenue, New York, N. Y., consulting engineers, for proposed new newsprint mill in Hardin County, near Savannah, previously referred to in these columns. Plant will comprise several large production units and is estimated to cost over $4,000,000, with machinery, for which orders are scheduled to be placed at early date. As recently announced, general erection contract has been let to Merritt-Chapman & Scott Corporation, 17 Battery place, New York, and land grading and other site preparation will begin soon. Gordon Browning, Huntingdon, Tenn., former Governor of Tennessee, is president.

New Orleans, La. — Fire recently damaged a portion of plant of the Letellier-Phillips Paper Company, 617 South Front street, New Orleans, paper specialties. An official estimate of loss has not been announced. The damage will be replaced at early date.

Memphis, Tenn.—The Shelby Paper Box Company, 61 West Colorado street, manufacturer of corrugated shipping containers, folding paper boxes and other paper containers, is having plans prepared by the H. K. Ferguson Company, Hanna Building, Cleveland, Ohio, engineer, for proposed new plant on local site on North Manassas street, near Firestone boulevard, recently referred to in these columns. It is expected to call for bids on general erection early this month. New plant will be one-story, designed for large capacity, and is reported to cost in excess of $75,000, with machinery. New and modernized equipment will be installed. Company is disposing of its present plant to the Valley Fibre Box Company, Memphis, now being organized by H. K. Wilkey, Memphis, and associates, which will take over the property, it is said, as soon as the Shelby company has its new plant ready for occupancy.

International Falls, Minn.—The Insulite Company, Builders' Exchange Building, Minneapolis, Minn., manufacturer of insulating board products, affiliated with the Minnesota and Ontario Paper Company, same address, will develop maximum capacity at its mill at International Falls, Company has received an order for about 7,000,000 square feet of structural insulating board, reported to total approximately $250,000 in value, from interests in the British Isles, to be used primarily for construction of temporary shelters and barracks for British troops at local training centers. It is expected to begin shipment of material from mill at early date. R. H. M. Robinson is president.

New York, N. Y.—The National Gypsum Company, 190 Delaware avenue, Buffalo, N. Y., manufacturer of wall board, insulating board and other products, has work nearing completion on new one-story mill at branch plant at East 150th street and East River, Bronx, New York, to be used for the production of board products, and will place the unit in service at early date. Equipment will be provided for large capacity. The structure has been in course of erection for several months past, and previously referred to in these columns. It will represent a reported investment in excess of $500,000. This is a new branch of production at the Bronx plant.

Shanghai, China—The Japanese Federation of Rayon Manufacturers, Tokyo, Japan, has plans under way for the early organization of a subsidiary interest, capitalized at about 30,000,000 yen (approximately $7,020,000), to construct and operate a new mill at Shanghai. Plant will comprise several large production units, of which a number will be completed in 1940 and remainder next year. New mill is reported to cost over $2,500,000, with machinery. It is said that certain equipment for the plant will be secured from present idle mills of different interests forming the Federation, and remainder of machinery purchased.

New York Paper and Pulp Market Review

Paper Sales Are Currently Maintained At Good Seasonal Level and Above Last Year — Paper Production Nearly 8 Per Cent Higher Than Like Week In 1939 — Pulp Prices Unchanged — All Other Markets Quiet.

Office of the PAPER TRADE JOURNAL.
Wednesday, March 6, 1940.

The volume of sales in the wholesale paper market is being maintained at a good level, according to reports received from many manufacturers' representatives, jobbers, and general paper merchants during the current week. The decline in wholesale sales from the peak of last year has been substantial. This decline, however, has been rather over emphasizied and the fact that business is seasonally good has not been given the publicity which the factual evidence seems to warrant.

For example, the report just issued by the Department of Commerce in cooperation with the National Association of Credit Men, indicates a gain of 22.1 per cent in January 1940 over the same month in 1939. This was the largest increase since October of last year, when sales rose 24.9 per cent. Although the decline for February of this year may be later reported as substantial, it is to be doubted at this date if anything like a business slump has occurred. The business prospect is supported by more optimistic facts than many business men seem to be aware of, which augurs well for the future. The slight decline in the current index of general business activity is also a sign of leveling off and is generally viewed as a favorable indication of increased activity when the Spring season opens.

The index of general business activity declined to 96.1 per cent for the week ended February 24, from 96.6 per cent for the preceding week, compared with 88.2 per cent for the like period last year.

Paper production of 201 mills was estimated at 84.8 per cent for the week ended February 24, compared with 76.9 per cent for 1939, with 71.3 per cent for 1938, with 91.6 per cent for 1937, and with 78.7 per cent for the corresponding week in 1936.

Paper board production for the week ended February 24 was 69.0 per cent, compared with 68.0 per cent for 1939, with 61.0 per cent for 1938, with 86.0 per cent for 1937, and with 65.0 per cent for the corresponding week in 1936.

No change of importance has been reported in the newsprint market during the current week. According to the latest reports of the Department of Commerce, exports of newsprint for the year 1939 increased 139 per cent in volume over the preceding year. Total imports of paper last year, 90 per cent of which was newsprint, was valued at $40,449,194.

Reports from many quarters of the trade this week indicate that sales volume is being well maintained. January business was above trade expectations and while volume declined in February, the drop was not severe and increased activity in some lines is reported this week. A good level of volume is reported in sulphite, tissue and kraft papers for the week.

Paper board sales are reported as a little more active this week, with prices in the metropolitan territory averaging the usual $5 per ton quotation under outside or New England territory. Chip and news are currently quoted at from $35 to $40 per ton, jute lined chip and single Manila lined chip at $55 per ton, and white patent coated at $67.50 per ton. Kraft liner board continues unchanged at $55 per ton.

Mechanical Pulp

No important change in prices or demand has been reported on any grade of mechanical pulp during the current week.

Chemical Pulp

Prices continue firm and unchanged on all grades of chemical pulp. Exports from Sweden, Finland, Norway and Rumania were reported at the port of New York for the week ended February 24 in good volume, considering the difficulties existing in overseas shipments.

Rags

The rag market is reported as quiet at this date. A definite price trend is lacking owing to the limited volume of trading. No price changes on any grade of new and old rags have been reported during the current week.

Old Rope and Bagging

Old rope prices continue to reflect marked firmness under a steady demand and a reported diminishing supply. Prices on domestic and foreign Manila rope have been advanced, foreign being currently quoted at from 5.00 to 5.75, and domestic Manila rope at from 4.75 to 5.00.

No change of importance has been reported in the old bagging market this week and prices remain unchanged with current trading reported as light.

Old Waste Paper

The demand for all grades of paper stock continues rather limited. No important price changes have been reported this week on any grade of old waste paper.

Twine

Prices on all grades of hard and soft fiber twines remain unchanged for the week, with the market reported as seasonally quiet in some quarters of the trade.

H. J. Farren Goes to Otter River

[FROM OUR REGULAR CORRESPONDENT]

OTTER RIVER, Mass., March 4, 1940—H. J. Farren has been appointed mill manager of the New England Pulp and Paper Company. Mr. Farren is well known throughout the industry having been manager and superintendent of some of the leading mills of the country including the Erving Paper Company, Erving, Mass.; West End Paper Company, Carthage, N. Y.; Crystal Paper Company, Middletown, Ohio; and the mill at Cornwall-On-Hudson, N. Y.

MISCELLANEOUS MARKETS

Office of the PAPER TRADE JOURNAL,
Wednesday, March 6, 1940.

BLANC FIXE—Prices on blanc fixe are firm under a moderate demand. Quotations conform to prevailing market levels. The pulp is currently quoted at $35 per ton in barrels, at works. The powder is quoted at $50 per ton, in bags, at works.

BLEACHING POWDER—Quotations on bleaching powder are firm and are reported unchanged at prevailing market prices. Bleaching powder is currently quoted at $2 per 100 pounds, in drums, at works.

CASEIN—Quotations on casein are unchanged for the week and conform to prevailing market prices. Standard domestic casein, 20-30 mesh, is currently quoted at 12 cents per pound; 80-100 mesh, at 12½ cents per pound. All prices in bags, car lots. Standard Argentina casein is quoted at 11 cents per pound. French casein is offered at 16 cents per pound.

CAUSTIC SODA—Prices on caustic soda are firm under a continued moderate demand. Solid caustic soda is currently quoted at $2.30 per 100 pounds; flake and ground at $2.70 per 100 pounds, in drums, at works.

CHINA CLAY—Quotations on china clay are firm and unchanged for the week. Domestic filler clay is currently quoted at from $7 to $15 per ton; coating clay at from $11 to $22 per ton, at mines. Imported clay is offered at from $13.50 to $25 per ton, ship side.

CHLORINE—The demand for chlorine is reported as moderately active this week. Prices are firm and unchanged and conform to prevailing representative market levels. Chlorine is currently quoted at $1.75 per 100 pounds, in single-unit tank cars, f.o.b., works.

ROSIN—The rosin market is firm and prices on some grades are a little higher this week. "G" gum rosin is currently quoted at $5.50 per 280 pounds, gross weight, in barrels, Savannah. "FF" wood rosin is offered at $5.45 per 280 pounds, gross weight, in barrels, New York. Gum rosin size is quoted at $2.90 per 100 pounds, f.o.b., shipping point.

SALT CAKE—Quotations on salt cake are firm under a steady demand and current prices are practically nominal. Domestic salt cake is quoted at $17 per ton, in bulk; chrome salt cake at $16 per ton; all prices in car lots, f.o.b., shipping point. The quotation of $20 per ton on imported salt cake continues nominal.

SODA ASH—Prices on soda ash are firm and conform to prevailing market quotations. Quotations on soda ash in car lots, per 100 pounds, are as follows: in bulk, $.90; in paper bags, $1.05; and in barrels, $1.35.

STARCH—Quotations on corn starch are unchanged for the week. Globe pearl is currently quoted at $2.60 per 100 pounds; special paper starch at $2.70 per 100 pounds. All prices in bags, car lots, f.o.b., Chicago.

SULPHATE OF ALUMINA—Prices on sulphate of alumina are firm under a steady demand. The commercial grades are currently quoted at $1.15 per 100 pounds; iron free at $1.45 per 100 pounds, in bags, car lots, f.o.b., works.

SULPHUR—Quotations on sulphur are unchanged and conform to prevailing market levels. Annual contracts are currently quoted at $16 per long ton, f.o.b., mines. Spot and nearby car lots are offered at $19 per ton.

TALC—Prices on talc are unchanged at prevailing market quotations. Domestic talc is currently quoted at from $15 to $18 per ton, Eastern mines. Imported talc is quoted at from $23 to $45 per ton.

MARKET QUOTATIONS

Paper

(Delivered New York)

News, per ton—			
Roll, contract	$50.00	@	—
Sheets	58.00	"	—
Kraft—per cwt.—Delivered Zone A			
Northern, Extra Quality	$5.00	@	$5.50
Superstandard	4.62½	"	5.00
Northern Standard Wrapping	4.25	"	4.62½
Standard Wrapping	4.00	"	—
Tissues—Per Ream—Carlots			
White No. 1	.92½	@	—
White No. 1 M. G.	.90	"	—
White No. 1½	.70	"	—
White No. 2	.65	"	—
Anti-Tarnish M. G.	.80	"	—
Colored	.87½	"	—
Kraft	.80	"	—
Manila	.65	"	—
Unbl. Toilet, 1 M.	3.50	"	—
Bleached Toilet	5.26	"	—
Paper Towels, Per Case—			
Unbleached, Jr.	1.95	@	—
Bleached, Jr.	3.20	"	—
Manila—per cwt.—C. l. f. a.			
No. 1 Jute	8.25	@	10.25
No. 1 Manila Wrapping, 35 lb.	5.25	"	—
No. 2 Manila Wrapping, 35 lb.	5.00	"	—
Boards, per ton—			
News	35.00	@	40.00
Chip	35.00	"	40.00
Sgl. Mla. Lt. Chip	55.00	"	—
White Pat. Coated	67.50	"	—
Kraft Liners	55.00	"	—
Binders Boards	76.00	"	87.00

The following are representative of distributors' resale prices:

Rag Content Bonds and Ledgers—White, Assorted Items, Delivered in Zone 1:

	Bonds	Ledgers
100% Rag Ext. No. 1	$39.10@$46.00	$40.25@$47.25
100% Rag	31.05 " 36.50	32.20 " 37.75
95% Rag	.... "	29.90 " 35.00
75% Rag	23.60 " 27.75	24.75 " 29.00
65% Rag	.... "	21.65 " 26.25
50% Rag	17.55 " 21.50	18.70 " 22.75
25% Rag	14.65 " 17.75	15.80 " 19.25

Colors at $1.00 cwt. extra.

Sulphite Bonds and Ledgers—White, Assorted Items, Delivered in Zone 1:

	Bonds	Ledgers
No. 1	$8.95@$11.00	$10.10@$12.25
No. 2	8.05 " 9.75	9.25 " 11.25
No. 3	7.60 " 9.25	8.50 " 10.75
No. 4	7.30 " 9.00	8.50 " 10.25

Colors $1.00 cwt. extra.

Free Sheet Book Papers—White, Cased Paper, Delivered in Zone 1:

No. 1 Glossy Coated	$11.90	@	$13.50
No. 2 Glossy Coated	10.35	"	11.75
No. 3 Glossy Coated	9.55	"	11.00
No. 4 Glossy Coated	9.15	"	10.50
No. 1 Antique (watermarked)	8.35	"	9.50
No. 2 Offset	7.70	"	9.00
A Grade E. F.	7.50	"	8.75
A Grade S. & S. C.	7.75	"	9.00
B Grade E. F.	6.95	"	8.00
B Grade S. & S. C.	7.20	"	8.25
C Grade E. F.	6.65	"	7.75
C Grade S. & S. C.	6.90	"	8.00
D Grade E. F.	6.40	"	7.50
D Grade S. & S. C.	6.65	"	7.75

Ivory & India at $.50 cwt. extra.

Mechanical Pulp

(On Dock, Atlantic Ports)

No. 1 Imported—			
Moist	$38.00	@	44.00
Dry	38.00	"	44.00
(Delivered)			
No. 1 Domestic and Canadian	40.00	@	42.00

Chemical Pulp

(On Dock, Atlantic, Gulf and West Coast Ports)

Bleached Sulphite (Domestic and Foreign)—			
Prime Bleached Sulphite	3.00	@	3.40
Prime Qualities—			
Easy-Bleaching Sulphite	2.75	"	2.95
Strong Unbleached Sulphite	2.75	"	2.85
(On Dock, Atlantic Ports)			
Kraft Bleached	3.00	@	3.50
Kraft Light & Strong	2.50	"	2.75
Kraft No. 1	2.40	"	2.65
(F. o. b. Pulp Mill)			
Kraft Domestic and Canadian	2.00	"	2.37½
(Delivered)			
Soda Bleached	2.90	"	—

Add 60 cents per short ton, dock charges for Albany; $2.50 for Lake Ports East and $3.50 for Lake Ports West of Mackinac Straits.

Domestic Rags

New Rags

(Prices to Mill f. o. b. N. Y.)

Shirt Cuttings—			
New White, No. 1	7.50	@	7.75
Silesias No. 1	4.50	"	4.75
New Unbleached	7.50	"	7.75
Blue Overall	5.00	"	5.25
Fancy	2.25	"	2.50
Washables	2.00	"	2.15
Mixed Khaki Cuttings	2.75	"	3.00
O. D. Khaki Cuttings	3.25	"	3.50

Old Rags

White, No. 1—			
Repacked	3.25	"	3.50
Miscellaneous	2.75	"	3.00
White, No. 2—			
Repacked	2.50	"	2.75
Miscellaneous	2.00	"	2.25
Thirds and Blues—			
Repacked	2.00	"	2.25
Miscellaneous	1.75	"	1.90
Roofing Rags—			
No. 1	1.50	"	1.55
No. 2	1.20	"	1.27½
No. 3 (bagging)	1.50	"	1.60
No. 4	.60	"	.65
No. 5A	.60	"	.65

Foreign Rags

All prices nominal.

New Rags

New Dark Cuttings	2.25	@	2.40
New Mixed Cuttings	2.00	"	2.20
New Light Silesias	5.50	"	5.75
Light Flannelettes	5.50	"	5.75
New White Cuttings	7.00	"	7.50
New Light Oxford	4.00	"	4.50
New Light Prints	3.00	"	3.25

Old Rags

No. 1 White Linens	7.50	"	8.50
No. 2 White Linens	6.50	"	7.50
No. 3 White Linens	4.50	"	—

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No. 4 White Linens.	2.25	@	3.25
No. 1 White Cotton.	4.25	"	4.75
No. 2 White Cotton.	3.25	"	3.75
No. 3 White Cotton.	2.50	"	3.00
No. 4 White Cotton.	1.90	"	2.20
Extra Light Prints..	2.00	"	2.40
Ord. Light Prints...	1.75	"	2.15
Med. Light Prints...	1.55	"	1.95
Dutch Blue Cottons.	2.25	"	2.50
French Blue Linens..	3.00	"	—
Checks and Blues...	2.00	"	—
Linsey Garments....	1.90	"	2.00
Dark Cottons.....	1.50	"	1.60
Old Shopperies.....	1.30	"	1.45
New Shopperies.....	1.45	"	1.50
French Blues.....	2.25	"	2.50

Old Rope and Bagging

(Prices to Mill, f. o. b. N. Y.)

Gunny No. 1—			
Foreign	2.75	@	3.00
Domestic	2.50	"	2.75
Wool Tares, light...	2.00	"	2.25
Wool Tares, heavy..	2.12½	"	2.25
Bright Bagging.....	2.25	"	2.50
Manila Rope—			
Foreign	5.00	"	5.75
Domestic	4.75	"	5.00
Jute Threads.....	3.00	"	3.25
Sisal Strings.....	2.00	"	2.25
Mixed Strings.....	.70	"	.85

Old Waste Papers

(F. o. b. New York)

Shavings—			
White Envelope Cuttings	3.10	@	3.25
Ordinary Hard White No. 1....	2.25	@	2.50
Soft White No. 1..	1.80	"	1.90
Soft White Extra..	2.50	"	2.60
Flat Stock—			
Stitchless	1.10	"	1.25
Overissue Mag....	1.00	"	1.10
Solid Flat Book...	.80	"	.90
Crumbled No. 1...	.70	"	.75
Ledger White Stock.	1.75	"	1.85
Ledger Stock Colored	1.05	"	1.15
Manila—			
New Env. Cut....	1.70	"	1.80
New Cuttings.....	1.30	"	1.40
Old Kraft Machine— Compressed bales..	1.35	"	1.40
News—			
No. 1 White News	1.75	"	1.90
Strictly Overissue.	.70	"	.75
Strictly Folded....	.47½	"	.52½
Corrugated	.60	"	.65
No. 1 Mixed Paper..	.27½	"	.32½

Twines

(F. o. b. Mill)

(Soft Fiber)

Coarse Polished—			
India	.18½	@	—
White Hemp.....	.18½	"	—
Fine Polished—			
Fine India.....	.23	"	—
Unpolished—			
Box	.14¾	"	—
Paper Makers.....	.15	"	—
Tube Rope.....	.16¼	"	—
Wall Paper.....	.15¾	"	—
Wrapping	.18	"	—
Soft Fiber Rope...	.16¼	"	—
Cotton	.21	"	—

(Hard Fiber)

Medium Java.....	.19	"	—
Mex. Sisal.....	.16	"	—
Manila	.24	"	—

PHILADELPHIA

Domestic Rags (New)

(Price to Mill, f.o.b. Phila.)

Shirt Cuttings—			
New White No. 1.	.07¼	@	.07½
New White No. 2.	.04	"	.04½
Light Silesias.....	—	"	.04½
Silesias, No. 1....	—	"	.04½
Black Silesias, soft	—	"	.03¾
New Unbleached..	.05½	"	.06
Washable, No. 1..	—	"	.04
Blue Overall.....	—	"	.05
Cottons—According to grades—			
Washable No. 2...	—	"	.02
New Blue	—	"	.02
Fancy Percales....	—	"	.03
New Black Soft....	—	"	.04
New Light Seconds	.04½	"	.05
New Dark Seconds	—	"	1.55
Khaki Cuttings—			
No. 1 O. D.....	.03½	"	.04
No. 2 Mixed.....	.03	"	.03¼
Corduroy	—	"	.02½
New Canvas.....	.05½	"	.06
New Black Mixed.	—	"	.03

Domestic Rags (Old)

White No. 1—			
Repacked	3.25	@	3.75
Miscellaneous	2.75	"	3.00
Thirds and Blues—			
Miscellaneous	2.00	"	2.25
Repacked	2.50	"	2.75
Black Stockings (Export)	3.50	"	4.00
Roofing Stock—			
Foreign No. 1....Nominal			
Domestic No. 1..	1.50	"	1.60
Domestic No. 2...	1.35	"	1.45
Roofing Bagging..	—	"	1.30

Bagging

(f.o.b. Phila.)

Gunny, No. 1—			
Foreign .....Nominal			
Domestic	2.50	@	3.00
Manila Rope.....	3.25	"	3.75
Sisal Rope.....	1.75	"	2.00
Mixed Rope.....	1.25	"	1.50
Scrap—			
No. 1.....	2.25	"	2.50
No. 2.....	—	"	1.30
Wool Tares, heavy..	3.50	"	3.70
Mixed Strings	.75	"	1.00
No. 1 New Light Burlap	3.00	"	3.50
New Burlap Cuttings	2.00	"	2.25

Old Papers

(f.o.b. Phila.)

Shavings—			
No. 1 Hard Write	2.25	@	2.30
No 2 Hard White	2.00	"	2.10
No. 1 Soft White	1.85	"	1.90
No. 2 Soft White	1.50	"	1.60
No. 1 Mixed.....	.90	"	1.00
Solid Ledger Stock..	1.50	"	1.60
Ledger Stock, white.	1.40	"	1.45
Ledger Stock, colored	1.10	"	1.20
No. 1 Books, heavy..	.90	"	.95
Manila Cuttings.....	1.75	"	1.80
Print Manila.....	.50	"	.55
Container Manila....	.40	"	.45
Kraft Paper.....	1.00	"	1.10
No. 1 Mixed Paper..	.30	"	.35
Straw Board Chip...	—	"	.40
Binders Board Chip..	.40	"	—
Corrugated Board...	.60	"	.65
Overissue News.....	.70	"	.75
Old Newspapers.....	.50	"	.55

BOSTON

Old Papers

(f.o.b. Boston)

Shavings—			
No. 1 Hard White	2.25	@	2.50
No. 1 Soft White	1.85	"	2.15
No. 2 Mixed.....	.75	"	.80
Solid Ledger Books..	1.30	"	—
Overissue Ledger Stock	1.30	"	1.50
Mixed Ledgers.....	.85	"	.90
No. 1 Books, heavy..	1.00	"	1.10
No. 1 Books, light..	.65	"	.75
Crumpled Stitchless Book Stock.....	.55	"	.65
Manila Env. Cuttings	1.70	"	1.85
Manila Envelope Cuttings, extra quality	2.35	"	2.60
White Blank News..	1.40	@	1.50
No. 1 Kraft.....	1.25	"	1.30
Mixed Papers.....	.35	"	.40
Print Manila.....	.65	"	.70
Container Manila...	.60	"	.70
Old Newspapers....	.60	"	.65
Paper Wool Strings..	.90	"	1.00
Overissue News.....	1.00	"	1.10
Box Board Chips....	.50	"	.52½
Corrugated Boxes...	.50	"	—
Kraft corrugated boxes	1.05	"	—
Screening Wrappers	.60	"	.70

Bagging

(f.o.b. Boston)

Manila Rope—			
Foreign	5.00	@	—
Domestic	4.00	@	4.50
Sisal Rope.....	2.25	"	2.65
Mixed Rope.....	.85	"	1.00
Transmission Rope..	3.00	"	3.50
Foreign	3.50	@	—
Soft Jute Ropes.....	3.00	"	3.50
Jute Carpet Threads.	1.50	"	1.75
Gunny Bagging—			
Foreign	3.00	"	—
Domestic	2.75	"	—
Bleachery Burlap....	3.50	"	3.75
Scrap Burlap—			
Foreign	2.60	"	—
Domestic	2.50	"	—
Scrap Sisal.....	2.25	"	2.50
Scrap Sisal for Shredding	2.30	"	2.65
Wool Tares, Heavy..	2.50	"	2.60
New Burlap Cuttings	3.25	"	3.50
Aust. Wool Pouches.	2.90	"	3.00
Heavy baling bagging	2.50	"	2.75
Paper Mill Bagging..	1.75	"	2.00
No. 2 Bagging	1.10	"	1.25

Domestic Rags (New)

(F. o. b. Boston)

Shirt Cuttings—			
New Light Prints...	.03¼	@	.03½
New White No. 1...	.08	"	.08¼
New Light Flannelettes	.05	"	—
Silesias No. 1	.05	"	—
New Black Silesias..	.03½	"	03¾
Soft Unbleached....	7.50	"	8.00
Blue Cheviots	.05½	"	.06
Fancy	.02	"	.02½
Washable	.02	"	.02½
Cottons—According to grades—			
Blue Overalls	.05¼	"	.05½
New Black, soft ..	.03¼	@	.04
Khaki Cuttings	.02½	"	.03
O. D. Khaki	03	"	.03¼
Corduroy	.02¼	"	.03
New Canvas.....	.06¾	"	.07¼
B. V. D. Cuttings...	.07	"	.07¼

Domestic Rags (Old)

(F. o.b. Boston)

Canvas	.04¼	@	—
White No. 1—			
Repacked	—	"	2.75
Miscellaneous	2.50	"	2.75
White No. 2—			
Repacked	1.90	"	2.00
Miscellaneous	2.00	"	2.25
Twos and Blues	2.25	"	2.50
Old Blue Overalls ..	1.60	"	2.00
Thirds and Blues—			
Repacked	2.00	"	2.25
Miscellaneous	1.50	"	1.60
Black Stockings	4.00	"	4.25
Roofing Stock—			
No. 1.....	1.75	"	2.00
No. 2.....	1.60	"	1.65
No. 3.....	1.00	"	1.25

Foreign Rags

(F. o. b. Boston)

Dark Cottons.....(nominal)	
Dutch Blues.....(nominal)	
New Checks and Blues(nominal)	
Old Fustians.....(nominal)	
Old Linsey Garments.(nominal)	
New Silesias.....(nominal)	

TORONTO

Paper

Bonds

Direct mill shipment in two-ton lots.			
No. 1 White .....$	36.50	@	—
No. 1 Tints	37.50	"	—
No. 2 White	26.50	"	—
No. 2 Tints	27.50	"	—
No. 2 Golden Rod..	28.50	"	—
No. 3 White	22.00	"	—
No. 4 White	15.50	"	—
No. 4 Tints	16.50	"	—
No. 4 Golden Rod..	17.50	"	—
Direct mill shipment in three-ton lots.			
No. 5 White .....$	10.40	@	—
No. 5 Tints	11.40	"	—
No. 5 Golden Rod..	12.40	"	—
No. 6 White	9.40	"	—
No. 6 Tints	9.90	"	—
No. 6 Golden Rod..	11.40	"	—
No. 7 White	8.40	"	—
No. 7 Tints	8.90	"	—
No. 7 Golden Rod..	10.40	"	—
Book—			
No. 1 M. F. ..... $	7.75	"	—
No. 2 M. F.	7.25	"	—
No. 3 M. F.	6.60	"	—
No. 1 S. C.	8.25	"	—
No. 2 S. C.	7.75	"	—
No. 3 S. C.	6.25	"	—

Coated Book & Litho

Ton Lots (resale)

No. 1 .....$	12.15	@	—
No. 2	10.50	"	—
No. 3	9.45	"	—
Coated tinted.....	13.20	"	—
Golden Rod.....	14.80	"	—
Wrapping—delivered—			
Rag Brown.....	4.85	"	5.25
White Wrap.....	4.00	"	—
"B" Manila.....	4.90	"	6.15
No. 1 Manila.... $	5.50	@	$6.90
Fiber	5.50	"	6.90
Kraft No. 2.....	5.50	"	6.90

(f.o.b. Cars, Toronto)

News per ton—			
Rolls (contract)..	46.00	"	—
Sheets	54.00	"	—

Pulp

Ground wood.....$	36.50	@	—
Unbleached sulphite.	54.00	"	—
Bleached sulphite...	64.00	"	—
Kraft	47.50	"	—
Soda	58.00	"	—

Old Waste Paper

(In carload lots, f.o.b. Toronto)

Shavings—			
White Env. Cut..	2.15	@	—
Soft White.....	2.00	"	2.15
White Blk. News..	1.35	"	1.50
Book and Ledger—			
Flat Magazine and Book Stock (old)	.90	"	1.00
Light and Crumpled Book Stock.....	.80	"	.90
Ledgers and Writings	1.15	"	—
Manilas—			
New Manila Cut..	1.55	"	1.60
Printed Manilas...	.70	"	—
Kraft	1.15	"	—
News and Scrap—			
Strictly Overissue	.75	"	—
Strictly Folded ..	.70	"	—
No. 1 Mixed Paper	.60	"	—

CHICAGO

Waste Paper

(f.o.b. Chicago)

Shavings—			
No. 1 White Envelope cuttings..	2.40	@	—
No. 1 Hard White	2.23	"	—
No. 1 Soft White	2.00	"	—
Ledger and Writings	1.20	"	—
Solid Books.....	.95	"	—
Blanks	1.70	"	—
Krafts	1.00	"	—
New Kraft Cuts.....	1.60	"	—
Overissue News.....	.80	"	—
Old Newspapers—			
No. 1 Folded News	.73	"	—
No. 1 Mixed Paper	.63	"	—
Roofing Stocks—			
No. 1	1.25	@	—
No. 2	1.15	"	—